FATIMA COLLEGE (AUTONOMOUS)

Re-Accredited with "A" Grade by NAAC (3rd Cycle)
74th Rank in India Ranking 2020 (NIRF) by MHRD
Maryland, Madurai- 625 018, Tamil Nadu, India

NAME OF THE DEPARTMENT: PHYSICS

NAME OF THE PROGRAMME : B.SC

PROGRAMME CODE : UAPH

ACADEMIC YEAR : 2020 - 21

FATIMA COLLEGE (AUTONOMOUS), MADURAI-18

DEPARTMENT OF PHYSICS

PROGRAMME CODE: UAPH

PART – III -MAJOR, ALLIED & ELECTIVES – 95 CREDITS

MAJOR CORE COURSES INCLUDING PRACTICALS : 60 CREDITS

S.NO	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	I	19P1CC1	Mechanics and Properties of Matter	5	4	40	60	100
2.		19P1CC2	Thermal Physics	4	3	40	60	100
3.		19P1CC3	Major practicals-I	3	2	40	60	100
4.	II	19P2CC4	Oscillations and Waves	5	4	40	60	100
5.		19P2CC5	Applied Mechanics	4	3	40	60	100
6.		19P2CC6	Major Practicals – II	3	2	40	60	100
7.	III	19P3CC7	Electromagnetism	5	4	40	60	100
8.		19P3CC8	Solid State Physics	4	3	40	60	100
9.		19P3CC9	Major Practicals – III	3	2	40	60	100
10.	IV	19P4CC10	Analog Electronics	5	4	40	60	100
11.		19P4CC11	Materials Science	4	3	40	60	100
12.		19P4CC12	Major Practicals – IV	3	2	40	60	100

13.	V	P5CC13	Digital Electronics and Communication	6	5	40	60	100
14.		P5CC14	Optics	6	4	40	60	100
15.		P5CC15	Major Practicals – V (Electronics)	4	2	40	60	100
16.		P5CC16	Major Practicals – VI (Non Electronics)	4	2	40	60	100
17.	VI	P6CC17	Thermodynamics &Statistical Mechanics	5	4	40	60	100
18.		P6CC18	Modern Physics	5	4	40	60	100
19.		P6CC19	Major Practicals – VII(Electronics)	3	2	40	60	100
20.		P6CC20	Major Practicals - VIII (Non Elec)	3	2	40	60	100

ALLIEDCOURSES- 20 CREDITS

S.NO	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. MKs
1.	I	19C1ACP1	Allied Physics – I	3	3	40	60	100
2.		19C1ACP2	Allied Physics Practicals -I	2	2	40	60	100
3.	II	19C2ACP3	Allied Physics – II	3	3	40	60	100
4.		19C2ACP4	Allied Physics Practicals -II	2	2	40	60	100
5.	III	19M3ACP1	Allied Physics – I	3	3	40	60	100
6.		19M3ACP2	Allied Physics Practicals –I	2	2	40	60	100
7.	IV	19M4ACP3	Allied Physics – II	3	3	40	60	100
8.		19M4ACP4	Allied Physics Practicals –II	2	2	40	60	100

ELECTIVES-15 CREDITS

S.No	SEM.	COURSE CODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	V	P5ME1/ P5ME2	Programming with C	5	5	40	60	100
2.	VI	P6ME1 / P6ME2	Microprocessor / Medical Physics	5	5	40	60	100
3.		P6ME3/ P6ME4	Optoelectronics / Energy Physics	5	5	40	60	100

PART – IV – 20 CREDITS

- **VALUE EDUCATION**
- **ENVIRONMENTAL AWARENESS**
- **NON MAJOR ELECTIVE**
- **SKILL BASED COURSES**

S.No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
1.	I	19G1VE	Value Education (Including Meditation in Action Movement)	1	1	40	60	100
2.		19P1NME	Non Major Elective (Offered to other major Students)	2	2	40	60	100
3.	II	19G2VE	Value Education	1	1	40	60	100
4.		19P2NME	Non Major Elective (Offered to other major Students)	2	2	40	60	100
5.	III	19G3EE	Environmental Education	1	1	40	60	100
6.		19P3SB1	Skill based –Bio mechanics	2	2	40	60	100
7.	IV	19G4EE	Environmental Education	1	1	40	60	100
8.		19P4SB2	Skill based – Physics of Stars	2	2	40	60	100
9.	V	P5SB3	Skill based –Physics of measuring instruments	2	2	25	75	100
10.		P5SB4	Skill based –Physics of medical instruments	2	2	25	75	100

S.No	SEM.	COURSECODE	COURSE TITLE	HRS	CREDIT	CIA Mks	ESE Mks	TOT. Mks
11.	VI	P6SB5	Skill based - Physics of instruments for Astronomical Measurements and Material Characterisation	2	2	25	75	100
12.		P6SB6	Skill based - Physics of advanced Medical Instruments	2	2	25	75	100

OFF-CLASS PROGRAMMES

ADD-ON COURSES

Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
COMPUTER APPLICATIONS (offered by The department of PGDCA for Shift I)	40	2	I & II	40	60	100
ONLINE SELF LEARNING COURSE- Foundation Course for Arts	40	3	I	50	-	50
ONLINE SELF LEARNING COURSE- Foundation Course for Science	40	3	II	50	-	50
ETHICAL STUDIES-Value Education	15	2	III-VI	50 each Semester	-	100
HUMAN RIGHTS	15	2	V	-	-	100
OUTREACH PROGRAMME- Reach Out to Society through Action **ROSA**	100	3	V & VI	-	-	100
PROJECT	30	4	VI	40	60	100
READING CULTURE	10/Semester	1	II-VI	-	-	-

Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
MOOC COURSES(Department Specific Courses) * Students can opt other than the listed course from UGC-SWAYAM UGC / CEC	-	Minimum 2 Credits	-	-	-	
TOTAL		22 +				

EXTRA CREDIT COURSE

Course Code	Courses	Hrs.	Credits	Semester in which the course is offered	CIA Mks	ESE Mks	Total Marks
19UGSLP1	**SELF LEARNING COURSEfor ADVANCE LEARNERS** **Nanoscience and Nanotechnolgy** **(offered for III UG)**	-	2	V	40	60	100

VALUE ADDED COURSES

19UGVA P1 - Crash Course on 'Digital Photography'
19UGVA CP1 - Certificate Course on 'Mobile Servicing'

I B.Sc.

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P1CC1	MECHNANICS AND PROPERTIES OF MATTER	Core	5	4

COURSE DESCRIPTION

The objective of this course is to understand the basic properties of matter and mechanics of fluids

COURSE OBJECTIVES

This course deals with understand in depth the gravitational force, field, potential and energy, study the acceleration due to gravity at various positions,knowledge about the properties of matter and compute the same,the mechanics of fluid motion and its applications

UNITS

UNIT –I GRAVITATION [15 HRS]

Newton's law of gravitation(self-study)- Gravitational field- Gravitational potential energy- Gravitational potential and field due to a spherical shell- gravitational potential and field due to a uniform solid sphere-Gravitational self energy –gravitation self energy of a sphere –gravitation self energy of the Sun.

UNIT –II ACCELERATION DUE TO GRAVITY and SATELLITES [15 HRS]

Acceleration due to gravity(self-study) – simple pendulum- variation of g at the poles and at the equator – variation of g with altitude- variation with depth- variation of g with rotation of Earth- difference between mass and weight- inertial mass and gravitational mass- satellites- stationary satellite- orbital velocity, period of revolution, escape velocity.

UNIT –III ELASTICITY [15 HRS]

Elasticity – Definitions(self-study) – Glass is more elastic than rubber – Yield

Point, Elastic limit, Elastic Fatigue – Poisson's ratio – Work done in deforming a body – Limiting value of Poisson's ratio -Torsion pendulum – Bending of Beams – Bending Moment – Beam supported at its ends and loaded in the middle – I- section Girders – determination of Y by bending.

UNIT –IV SURFACE TENSION [15 HRS]

Surface tension(self-study) – Explanation of surface tension – **Examples of surface tension(**self-study) – Surface energy and surface tension- Pressure difference across a spherical surface – Excess of pressure inside a spherical liquid drop – Excess of Pressure inside a soap bubble – angle of contact-Capillarity –Expression for Surface tension – Determination of Surface tension of water – **Examples of Capillarity**(self-study).

UNIT –V FLUIDS DYNAMICS [15 HRS]

Fluid motion- introduction- stream line flow and rate of flow- equation of continuity- energy of a liquid in motion- Bernoulli's Theorem- practical applications- venturimeter- Bunsen burner- atomizer or sprayer- carburetor- wings of an aero plane- blowing of roofs – spinning ball- Viscosity- Poiseuille's method for coefficient of viscosity.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (10 HRS.)

Gravitation of self energy of stars – end stage of stars – Red giant, white dwarf, Neutron stars – Black holes-History of Indian Satellites – applications – Launch vehicle- types of fuel –process of satellite launchBeams and girders in bridges and multistorey buildings - Surfactants – properties and uses – Low pressure formation in oceans – cause of storms.

REFERENCES:

1) Brijlal , N.Subrahmanyam and Jivan Seshan, MECHANICS AND ELECTRODYNAMICS, New Delhi, Eurasia Publishing House (Pvt.) Ltd. Ram Nagar.
2) Brijlal and N.Subrahmanyam , Properties of Matter,Vikas Publishing House Pvt. Ltd.

COURSE OUTCOMES

On the successful completion of the course, students will be able :

NO.	COURSE OUTCOMES
CO 1	Explain gravitational force, gravitational field, gravitational potential and gravitational energy
CO 2	Analyze the variation of 'g' with latitude, altitude, depth and rotation of earth and Identify the types of satellite orbits and compute the parameters of satellite motion
CO3	Discuss the elastic properties of materials and compute the Young's modulus of a beam
CO4	Describe surface tension and capillarity property of liquids and identify its applications
CO5	Explain the dynamics of fluid motion and its applications and analyse the viscose property of liquids

I B.Sc.,PHYSICS

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P1CC2	THERMAL PHYSICS	MAJOR CORE	4	3

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principles and processes of significant topics of thermal physics like Kinetic theory of gases, Transport phenomena in gases and Liquefaction of gases.

COURSE OBJECTIVES

This course deals with the elemental concepts of molecular properties of gases and enhance the experimental, analytical skills of the students on Maxwellian Distribution of speeds in an Ideal gas, transport phenomena and production of very low temperatures.

UNIT –I KINETIC THEORY OF GASES (12HRS.)

Three states of matter-Concept of ideal or perfect Gas-Kinetic model-Expression for the pressure exerted by a gas-Estimation of rms speed of Molecules-**Kinetic energy per unit volume of a Gas**- Derivation of Gas equation- Avogadro's Hypothesis- Graham's Law of Diffusion of Gases-Brownian motion- Langevin's Theory of Brownian Motion- Einstein's Theory of Brownian motion- Degrees of Freedom.

UNIT –II MAXWELLIAN DISTRIBUTION OF SPEEDS IN AN IDEAL GAS:

(12 HRS.)

Mean (or) Average speed, Root Mean Square speed and Most Probable Speed-Maxwell's Distribution Law of Velocities-Experimental verification of Maxwellian Distribution of Molecular speeds-Zartman and C.C.Ko experiment.

UNIT –III TRANSPORT PHENOMENA IN GASES: **(12 HRS.)**

Introduction –Molecular Collisions-Mean Free Path- Expression for Mean Free Path-Transport phenomena- Viscosity: Transport of Momentum –Thermal conductivity: Transport of thermal energy- **Relation between η and k–Effect of temperature on k** –Largest Thermal Conductivity of Hydrogen- Self diffusion: Transport of mass

UNIT –IV PRODUCTION OF VERY LOW TEMPERATURES: (12 HRS.)

Introduction- **Method of freezing mixture**- cooling by evaporation under reduced pressure- Cooling by adiabatic expansion- Joule-Thomson expansion- Adiabatic demagnetization-Superconductivity.

UNIT –V LIQUEFACTION OF GASES: (12 HRS.)

Liquefaction of gases- principle of Regenerative Cooling- Liquefaction of Air (Linde's process)- **Liquefaction of Hydrogen**-Liquefaction of Helium- Helium I and Helium II- Some peculiar properties of Helium II- Helium 'A unique liquid'.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Cryogenic Rocket propulsion

REFERENCES:

1. Brijlal , Dr. N.Subramanyam , P.S.Hemne, *HEAT THERMODYNAMICS AND STATISTICAL PHYSICS* , New Delhi-S. Chand & Company Pvt.Ltd.
2. J.K. Sharma and K.K. Sarkar, THERMODYNAMICS *AND STATISTICAL PHYSICS,* Himalaya Publications.
3. Mathur, M.L., and Sharma, R.P., "Gas Turbine, Jet and Rocket Propulsion", Standard Publishers and Distributors, Delhi, 1988

WEB REFERNCES:

1. www.britannica.com/science/kinetic-theory-of-gases
2. astrowww.phys.uvic.ca/~tatum/thermod/thermod15.pdf
3. https://www.isro.gov.in/gslv-d5-gsat-14/indigenous-cryogenic-engine-and-stage

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	analyse a microscopic approach and seek to account for the macroscopic properties of a gas in terms of properties of its molecules
CO 2	explain the classical Maxwell's distribution law of velocity and its inference.
CO 3	describe molecular collisions and its mean free path , understand the process of thermal conductivity, viscosity and diffusion in gases
CO 4	depict the manner in which the energy changes takes place and outline the different methods to produce low temperature
CO 5	demonstrate the liquefaction of gases and explain the nature of gases in the neighbourhood of absolute zero temperature.

I B.Sc.,PHYSICS

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P1CC3	MAJOR PRACTICALS -I	UG CORE	3	2

COURSE DESCRIPTION

The objective of this course is to develop practical skills to use physics apparatus

COURSE OBJECTIVES

This course offers opportunity to handle the laboratory equipment's and develops lab skills in gain hands-on experience to use microscope and telescope, measure the relevant parameters and calculate the elastic modulus of materials, measure the relevant parameters and calculate the properties of matter, study the formation of longitudinal and transverse vibrations

LIST OF EXPERIMENTS

1. Determination of Youngs' Modulus of Uniform bending.(scale & telescope)
2. Determination of Youngs' Modulus of Non-Uniform bending (pin & microscope).
3. Determination of 'g' of Compound pendulum
4. Determination of Surface Tension & Interfacial surface tension by Drop Weight Method
5. Melde's String - Determination of the frequency of vibrator
6. Determination of surface tension by Capillary rise method
7. Specific Heat Capacity of liquid- Method of mixture using Barton's Correction

I B.Sc. Chemistry

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19C1ACP1	ALLIED PHYSICS-I	ALLIED CORE	3	3

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like Waves and Oscillations, Properties of matter, Electricity and Magnetism and Geometrical Optics.

COURSE OBJECTIVES

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Simple Harmonic motion, Elasticity of solid matters, viscosity of liquids and thermal properties of Gas, magnetic effect of electric current, Refraction, dispersion of optical devices.

UNITS

UNIT I: WAVES AND OSCILLATIONS [9HRS]

Simple Harmonic motion- Composition of two simple harmonic motions in a straight line-Composition of two simple harmonic motions of equal time periods at right angles-Lissajous's figures- Uses– laws of transverse vibrations of strings – Melde's string – transverse and longitudinal modes.

UNIT –II PROPERTIES OF MATTER [9HRS]

Elasticity –Different Moduli of Elasticity- Poisson's ratio.
Streamline flow and Turbulent flow–Coefficient of Viscosity-Rate of Flow of liquid in a Capillary Tube- Poiseuille's Formula (Method of dimensions) - Poiseuille's Method for determining coefficient of viscosity of liquid- Comparison of viscosities of two liquids.
Surface Tension: Molecular theory of surface tension-pressure difference across a liquid surface-Excess Pressure inside a liquid drop- Excess pressure inside a soap bubble.

UNIT –III THERMAL PHYSICS [9HRS]

Postulates of Kinetic theory of gases – Van der Waals equation of state – Derivation of Critical Constants - Joule Kelvin effect – Joule Thomson porous plug experiment –Laws of thermodynamics- Heat Engine– entropy - changes of entropy in reversible and irreversible processes.

UNIT –IV ELECTRICITY AND MAGNETISM [9HRS]

Capacitor-energy of charged capacitors -Loss of energy on sharing of charges between two capacitors- magnetic effect of electric current-Biot Savart's law-Magnetic induction at a point on the axis of a circular coil.

UNIT –V GEOMETRICAL OPTICS [9HRS]

Laws of Refraction – Refractive index by travelling microscope, Refraction through Prism - Dispersion through a prism – Expression for dispersive power of the material of a thin prism – Combination of two prisms to produce dispersion without deviation - Combination of two prisms to produce deviation without dispersion.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) [2HRS]

New droplet-based electricity generator - The impact of magnetic materials in renewable energy

REFERENCES:

1. Allied Physics by R.Murugeshan (2012- I Edition) *Allied Physics,* Ram Nagar, New Delhi: S. Chand & Company Ltd.

WEB REFERNCES :

1.**https://study.com/academy/lesson/physical-property-of-matter-definition-examples- quiz.html**
2.**https://www.physicsforums.com**
.**https://www.kullabs.com/classes/subjects/units/lessons/notes/note-detail/1761**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Define and discuss about the simple harmonic waves and its oscillations and laws of transverse vibrations of strings.
CO 2	Classify and describe the properties of matter such as electricity, viscosity and surface tension.
CO 3	Summarise the basic concepts of thermal physics and apply the laws of thermodynamics in higher learning concepts such as entropy and its reversible and irreversible process.
CO 4	Explain the principles and laws used in electricity and magnetism those are useful in defining the energy of a capacitor and magnetic effect of electric current.
CO 5	Demonstrate the properties of geometrical optics and explain the refraction and dispersion through a prism.

I B.Sc. Chemistry
I SEMESTER
For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19C1ACP2	ALLIED PHYSICS PRACTICALS -I	ALLIED CORE	2	2

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied core courses.

COURSE OBJECTIVE/S

This course enables the students to develop basic lab skills.

LIST OF EXPERIMENTS (Any eight)

1. Comparison of coefficient of viscosity of two liquids
2. Determination of coefficient of viscosity
3. Determination of Surface Tension – Capillary rise method
4. Determination of Surface Tension – Drop Weight method
5. Determination of Latent heat of fusion of Ice
6. Determination of Young's Modulus - Uniform bending (optic lever)
7. Determination of specific heat capacity of a liquid-Newton's law of cooling
8. Determination of focal length of biconvex lens (UV& Distant object Methods).
9. Determination of refractive index of liquid
10. Determination of rigidity modulus – Torsion Pendulum

I B.Sc.

SEMESTER –I

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P1NME1	Physics in Everyday life	Lecture	2	2

COURSE DESCRIPTION

Aim of this course is to enable the student to understand the physics concepts in day today life.

COURSE OBJECTIVES

This course imparts basic ideas of physical quantities, standards and units. It further deals with mechanics and properties of matter comprising the concepts of Newton's law of motion, impulse, work, power and energy, moment of a force etc., Also this course throws light on the fundamental knowledge on concepts of heat, waves, sound, electricity, magnetism and explore their nature.

UNIT-I **(5 HRS.)**

MECHANICS

Physical quantities , standards and units : Unit of length, unit of mass and unit of time, Motion, Force, Newton's law of motion

UNIT-II **(8 HRS.)**

PROPERTIES OF MATTER

Impulse, work, power and energy, moment of a force, Centre of gravity, Machines, Artificial satellites Density and relative density, Pressure, upthrust, Hydrometer, Matter and its properties, Motion of fluids- Bernoulli's theorem

UNIT –III **(7 HRS.)**

HEAT: Internal energy, thermal expansion, transmission of heat, Quantity of heat, Change of state, relative humidity, Air conditioning, Pressure cooker

WAVE MOTION: Electromagnetic radiation, radio and television transmission,

Radar, Microwave oven

UNIT –IV **(4 HRS.)**

SOUND: Sound characteristics, The speed of sound, Reflection of sound and Echo, Doppler effect, sonic boom

UNIT –V **(6 HRS.)**

STATIC ELECTRICITY: Electricity of Friction, insulators, Conductors, Super conductors and semiconductors
CURRENT ELECTRICITY: Effects of electric current, Power generations and transmission, Domesitic Electric installation, Electric light
MAGENTISM: Earth's magnetism

REFERENCES:

1. Dr.Tara Chand(2007), GENERAL STUDIES MANUAL, TMH

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Discuss and illustrate the importance of paying attention to the basic units of physical quantities and the standards accepted for their measurement, describe the motion in terms of particle's position, velocity and acceleration and analyse the cause of motion
CO 2	Understand the concepts of heat, waves, sound, electricity, magnetism and explore their nature.

I B.Sc Computer Science
SEMESTER –I
For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19B1ACP1	DIGITAL PRINCIPLES AND APPLICATIONS	Core	5	5

COURSE DESCRIPTION

The course provides a conceptual based exposure to the fundamental principal and processes of significant topics of Digital Electronics which forms the basis for Computer Architecture.

COURSE OBJECTIVES

This course will improve the elemental concepts and enhance the intellectual and analytical skills of the students on Number systems and codes, Circuit analysis and design, Data processing circuits, Flip flop and registers and Counters.

UNIT -I NUMBERS AND SYSTEMS AND CODES [15HRS]

Binary number System – Octal numbers – hexadecimal numbers – ASCII code – Excess-3 code – Gray Code, Logic Circuits: Inverters – OR Gates – AND Gates- NOR Gates – NAND gates- Exclusive OR Gates.

UNIT –II CIRCUIT ANALYSIS AND DESIGN [15HRS]

Boolean Algebra – Sum-of-Products method – Truth Table to Karnaugh map – Karnaugh Simplifications – Don't care conditions – product-of-Sums method

UNIT –III Data Processing Circuits [15HRS]

Multiplexers – Demultiplexers.

Arithmetic circuits: Binary Addition – Binary subtraction – Unsigned Binary numbers – Sign-Magnitude Numbers – 2's Complement representation – 2's Complement Arithmetic – Arithmetic Building Blocks – The Adder- Subtracter

UNIT –IV Flip Flops and registers [15HRS]

Flip- Flops: RS Flip-Flop – Gated Flip-Flops – Edge Triggered RS Flip flops- Edge Triggered D Flip-Flop –Edge Triggered JK flip flop – JK Master Slave Flip Flop.Shift registers: Serial In-Serial Out – Serial In-Parallel out – Parallel In-Serial Out – Parallel In- Parallel Out - Application of shift registers (Switched tail Counter only)

UNIT –V Counters [15HRS]

Asynchronous Counters – Synchronous Counters(3 bits only) – Mod-3 Counter – Decade Counters, D/A and A/D conversion: Variable – resistor networks, Binary ladder, D/A converter, A/D converter- Simultaneous Conversion, Counter Method.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) [2HRS]

Artificial Intelligence-Machine Learning- Robotics

TEXT BOOK:

1. Albert Paul Malvino and Donald P. Leach, *Digital principles and applications*, Tata McGraw-Hill, Sixth Edition

REFERENCE BOOKS:

1. R.P. Jain, *Modern digital Electronics*, Tata McGraw-Hill, III edition,2006
2. Thomas C Bartee , *Digital Computer Fundamentals*, McGraw Hill; 5th edition,1981
3. M. Morris Mano, *Digital Logic and computer design*, Prentice-Hall, 2000

WEB REFERNCES :

1.**http://www.ee.surrey.ac.uk/Projects/Labview/minimisation/karrules.html**

2.**https://www.ebookbou.edu.bd/Books/Text/SST/DCSA/dcsa_2301/Unit-07.pdf**

3.**https://www.tutorialspoint.com/computer_logical_organization/digital_counters.htm**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	define the different types of number systems and explain the basic and universal logic circuits
CO 2	simplify the logic expressions using Boolean laws and Kmap
CO 3	describe the principles behind the data processing and arithmetic circuits
CO 4	explain the working of basic flipflops and design master slave flipflops
CO 5	understand the working of shift registers and counters Students will be able to describe D/A and A/D conversion techniques

I B.Sc

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P2CC4	OSCILLATIONS AND WAVES -	MAJOR CORE	5	4

COURSE DESCRIPTION

To understand waves, oscillations and its applications in human ear, musical instruments. To know about Doppler effect, Ultrasonics and various applications of them

COURSE OBJECTIVES

This course deals with simple harmonic motion, Principle of Superposition and their mathematical representation of stationary waves, interference waves and beats, their conditions, Doppler effect in acoustics and apply the same and solving problems, different range of acoustic waves, ultrasonic waves generation and its application.

UNIT I: SIMPLE HARMONIC MOTION [15 HRS]

Introduction- simple harmonic motion- differential equation of SHM- graphical representation of SHM- total energy of vibrating particle- simple pendulum- **simple harmonic oscillations of a loaded spring(**self-study**)**- free vibrations- undamped vibrations- damped vibrations- forced vibrations, resonance and sharpness of resonance, Quality factor.

UNIT II: Progressive waves [15 HRS]

Wave motion- what propagates in wave motion?- characteristics of wave motion of simple harmonic wave- Transverse wave motion- longitudinal wave motion- definitions- relation between frequency and wavelength- Equation of simple harmonic wave- Differential equation of wave motion- particle velocity and wave velocity- energy of a progressive wave.

UNIT III: STATIONARY WAVES, INTERFERENCE AND BEATS [15 HRS]

Stationary waves- properties properties of stationary longitudinal waves- analytical treatment of open end organ pipe or string free at the other end (open end pipe only).

Interference of sound waves- special cases- conditions for interference of sound waves.Beats- analytical treatment of beats.

UNIT IV: DOPPLER EFFECT [15 HRS]

Doppler effect- observer at rest and source in motion- source at rest and observer in motion- both source and observer are in motion- effect of wind velocity - tracking of artificial satellites

UNIT V: MUSIC AND ULTRASONICS [15 HRS]

Musical Sound and Noise (self-study)– Speech – Human Voice – human Ear – Characteristics of Musical Sound – Intensity of Sound – Bel – **Musical Scale – Limits of Audibility**(self-study)**.** Ultrasonics – Production of Ultrasonic Waves (Piezoelectric oscillator ONLY) – Acoustic grating – **Applications of Ultrasonic Waves**(self-study)

UNIT VI - DYNAMISM/CURRENTAFFAIR((Evaluation Pattern-CIA only) (HRS.)

Simple Harmonic Motion – examples in day-to-day life – resonance phenomena –examples and its effect- Different musical scales – musical instruments – music generation and notes-frequency tuning systems- Voice spectrographs- Noise cancelling earphones. Advanced ultrasound scanners- Ultrasound in surgery.

REFERENCES:

TEXT BOOKS:

1) N.Subrahmanyam, Brijlal, *WAVES AND OSCILLATIONS* , Vikas Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1. Robert Resnick , David Halliday, Kenneth S. Krane *PHYSICS (fifth edition)* , John Wiley and sons, Inc.
2. Paul G. Hewitt , *CONCEPTUAL PHYSICS* (tenth edition), Pearson education Inc.and Dorling Kindersey Publishing

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Describe simple harmonic motion and explain damped and forced oscillations
CO 2	Explain the Principle of superposition in sound waves
CO3	Apply the same to interference, stationary waves and beats of sound waves
CO4	Explain Doppler effect in sound and identify relative motion and solve problems
CO5	Discuss ultrasonics and its applications & Outline the physics of voice generation and hearing

I B.Sc.

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P2CC5	APPLIED MECHANICS	MAJOR CORE	4	3

COURSE DESCRIPTION

The course enables the students to understand the fundamental and advanced concepts of Central force, Projectile motion, interrelationship between energy and work, linear momentum and angular momentum.

COURSE OBJECTIVES

This course enhance the intellectual, experimental, analytical skills of the students on Kepler's laws of Planetary motion, Projectile motion, collisions, law of conservation of linear momentum and law of conservation of angular momentum.

UNIT –I CENTRAL FORCE (12 HRS.)

Newton's second law of motion- central force – central force motion is confined to a single plane – angular momentum and energy are constants – Law of equal areas - law of orbit- Kepler's third law.

UNIT –II PROJECTILE MOTION (12 HRS.)

Projectile motion- Maximum height- Maximum Range- Special cases- **Horizontal Projection**-Object thrown from Airplane- Fast –Moving Projectiles-Satellites.

UNIT –III WORK AND KINETIC ENERGY (12 HRS.)

Work and Kinetic Energy- Workdone by a constant force-**Translatory motion**-Workdone by a variable force- Kinetic energy and the work-energy theorem.

UNIT –IV LINEAR MOMENTUM (12 HRS.)

Center of mass – Center of mass coordinates -**Motion of centre of mass and linear momentum**- -collisions- Elastic collisions- Inelastic collisions – Coefficient of Restitution-Rocket motion.

UNIT –V ANGULAR MOMENTUM (12 HRS.)

Dynamics of rigid body- Rotational Kinetic energy, Moment of inertia and it's physical significance-Angular momentum and angular velocity-Angular acceleration-Angular momentum-Law of conservation of angular momentum-torque- **analogy between translatory motion and rotatory motion** – workdone by a torque.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Atmospheric angular momentum –Weather forecast

REFERENCES:

1. Brijlal, N.Subrahmanyam and Jivan Seshan, *MECHANICS AND ELECTRODYNAMICS,* New Delhi -EURASIA Publishing House (PVT.) LTD..
2. Brijlal and Subrhamanyam (V edition), *PROPERTIES OF MATTER* , New Delhi -Eurasia Publishing Pvt. Ltd.
3. Robert Resnick, David Halliday and S. Krane (Vol I- fifth edition-) ,*PHYSICS*- John Wiley & Sons, Inc.
4. Francis W. Sears, Mark W. Zemansky and Hugh D. Young(Sixth edition), *UNIVERSITY PHYSICS*-New Delhi -Narosa Publishing House.
5. Paul G. Hewitt (tenth edition), *CONCEPTUAL PHYSICS*, Pearson Education, Inc.and Dorling Kindersley Publishing, Inc.

WEB REFERNCES

1. physics.oregonstate.edu/~mcintyre/COURSES/ph426_W12/cfnotes.pdf
2. *https://***ocw.mit.edu***/.../***lecture***-notes/MIT***16_07***F09_Lec15.pdf*
3. https://ocw.mit.edu/.../lecture-notes/MIT16_07F09_Lec16.pdf
4. https://ui.adsabs.harvard.edu/
5. https://royalsocietypublishing.org/doi/10.1098/rsta.1991.0003

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	demonstrate an understanding of central forces and explain Kepler's laws of Planetary motion
CO 2	compute the path of projectile launched with horizontal and vertical velocity components in the Earth's gravity
CO 3	evaluate the interrelationship between energy and work
CO 4	describe the motion of the center of mass of an object, state the conservation principles involving momentum and explore its applications, analyse collisions between two objects
CO 5	apply law of conservation angular momentum appropriately in rigid body rotations, relate the rotational and translational parameters based on rotational kinematics.

I B.Sc. PHYSICS

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P2CC6	MAJOR PRACTICALS -II	PRACTICAL	3	2

COURSE DESCRIPTION

The objective of this course is to develop practical skills to use physics apparatus

COURSE OBJECTIVES

- To gain hands-on experience to use microscope and telescope
- To measure the relevant parameters and calculate the elastic modulus of materials
- To measure the relevant parameters and calculate the properties of matter

LIST OF EXPERIMENTS

1. Determination of Rigidity Modulus - Static torsion(scale & telescope).
2. Determination of Rigidity Modulus of the wire-Torsional Pendulum
3. Determination of Young's Modulus - Cantilever Depression
4. Determination of Viscosity- Capillary Flow Method
5. Specific Latent Heat of Ice Method of mixture using Barton's Correction
6. Specific Heat Capacity of liquid - Newton's Law of cooling
7. Comparison of viscosities of two liquids
8. Determination of Thermal Conductivity of Bad Conductor-Lee's disc Method.

I B.Sc. CHEMISTRY

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19C2ACP3	ALLIED PHYSICS-II	LECTURE	3	3

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like geometrical Optics, Atomic Physics, Nuclear Physics and Electronics

COURSE OBJECTIVES

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Atomic Physics, Nuclear Physics, Electronics and Physical optics.

UNITS - 6

UNIT I: PHYSICAL OPTICS (9 HRS.)

Velocity of light-Michelson's method-Interference in thin films-Production of colours in thin films-Air wedge-Diffraction- Polarisation- Polarisation by reflection-Double refraction –Nicol Prism.

UNIT II: ATOMIC PHYSICS (9 HRS.)

Introduction – Rutherford's experiments on scattering of alpha particles- Bohr atom model – Bohr formula – calculation of total energy – Bohr's Interpretation of Hydrogen spectrum – Spectral series of hydrogen atom .

UNIT III: NUCLEAR PHYSICS (9 HRS.)

Models of Nuclear Structure -The Liquid Drop Model-Mass defect-Binding energy- Nuclear fission-chain reaction - atom bomb-energy released in fission

- Nuclear reactor-Nuclear Fusion.

UNIT IV: BASIC ELECTRONICS (9 HRS.)

Formation of p-n Junction Diode-Forward and Reverse Biasing of a Junction Diode-V-I Characteristics of a Junction Diode-The Zener Diode-Experiment to study the characteristics of Zener diode-Junction Transistor-working of NPN transistor - common emitter characteristics of a transistor.

UNIT V: DIGITAL ELECTRONICS [9 HRS]

Decimal Number system- Binary Number system-conversion of Binary number into decimal number-conversion of decimal number into binary number- Octal Number system-Hexadecimal number system – Boolean Algebra-Boolean addition and multiplication-Logic Expressions-commutative laws-associative laws-distributive law-Rules for Boolean algebra-De Morgan's Theorem

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Role of Michelson interferometer in Atmospheric and space applications **-** Working of pocket calculators, and cd players

REFERENCES

1. R.Murugesan "Allied Physics" Second Edition 2012, Ram Nagar, New Delhi: S. Chand & Company Ltd.
2. R. Murugeshan & Kiruthiga Sivaprasath "Modern Physics" 2007,S.Chand & Company Ltd., 2007.

WEB REFERENCES (OPTIONAL)

1. https://www.khanacademy.org/science/physics/quantum-physics/atoms-and-electrons/v/atomic-energy-levels
2. https://www.nature.com/subjects/nuclear-physics
3. https://www.dictionary.com/browse/physical-optics

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Categorize and clarify the different optical phenomena of interference, diffraction, polarization.
CO 2	Explain the atom model and calculate the total energy of an atom and account for the spectral series of hydrogen atom.
CO 3	Elucidate the models of nuclear structure and to learn the principle behind atom bomb, nuclear reactors.
CO 4	Summarize the working principle of p-n junction diode in forward and reverse biasing, it's V-I characteristics, the Zenor Diode, n-p-n transistor in common emitter characteristics.
CO 5	Classify the number system and demonstrate the skill in conversion of Number systems, Boolean algebra and its associated laws.

I B.SC CHEMISTRY

II SEMESTER

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19C2ACP4	ALLIED PHYSICS PRACTICALS -II	ALLIED CORE	2	2

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied courses.

COURSE OBJECTIVE/S

This course enables the students to develop basic lab skills.

LIST OF EXPERIMENTS (Any eight)

1. Low range Voltmeter calibration using Potentiometer
2. Air wedge - Determination of thickness of insulation
3. Diode characteristics – (Forward & Reverse bias)
4. Ohm's law verification
5. Bridge rectifier
6. Verification of AND, OR, NOT, NAND and NOR gates
7. Verification of Boolean expressions
8. NAND as universal gate
9. NOR as universal gate
10. De Morgan's theorems

I B.Sc.

SEMESTER –II

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P2NME2	Physics in Everyday life	Lecture	2	2

COURSE DESCRIPTION

Aim of this course is to enable the student to understand the physics concepts in day today life.

COURSE OBJECTIVES

This course imparts basic ideas of physical quantities, standards and units. It further deals with mechanics and properties of matter comprising the concepts of Newton's law of motion, impulse, work, power and energy, moment of a force etc., Also this course throws light on the fundamental knowledge on concepts of heat, waves, sound, electricity, magnetism and explore their nature.

UNIT-I **(5 HRS.)**

MECHANICS

Physical quantities , standards and units : Unit of length, unit of mass and unit of time, Motion, Force, Newton's law of motion

UNIT-II **(8 HRS.)**

PROPERTIES OF MATTER

Impulse, work, power and energy, moment of a force, Centre of gravity, Machines, Artificial satellites Density and relative density, Pressure, upthrust, Hydrometer, Matter and its properties, Motion of fluids- Bernoulli's theorem

UNIT –III **(7 HRS.)**

HEAT: Internal energy, thermal expansion, transmission of heat, Quantity of heat, Change of state, relative humidity, Air conditioning, Pressure cooker

WAVE MOTION: Electromagnetic radiation, radio and television transmission, Radar, Microwave oven

UNIT –IV **(4 HRS.)**

SOUND: Sound characteristics, The speed of sound, Reflection of sound and Echo, Doppler effect, sonic boom

UNIT –V **(6 HRS.)**

STATIC ELECTRICITY: Electricity of Friction, insulators, Conductors, Super conductors and semiconductors
CURRENT ELECTRICITY: Effects of electric current, Power generations and transmission, Domesitic Electric installation, Electric light
MAGENTISM: Earth's magnetism

REFERENCES:

2. Dr.Tara Chand(2007), GENERAL STUDIES MANUAL, TMH

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Discuss and illustrate the importance of paying attention to the basic units of physical quantities and the standards accepted for their measurement, describe the motion in terms of particle's position, velocity and acceleration and analyse the cause of motion
CO 2	Understand the concepts of heat, waves, sound, electricity, magnetism and explore their nature.

II B.Sc.

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P3CC7	Electromagnetism	Major Core	5	5

COURSE DESCRIPTION

This course provides an exposure to electric field, electric potential energy, magnetic field, magnetic field of current, magnetic dipole moment, magnetization and Maxwell's electromagnetic waves

COURSE OBJECTIVES

This course deals with fundamentals of electricity, magnetism and electromagnetic theory based on Maxwell's equations

UNITS

UNIT –I THE ELECTRIC FIELD (12 HRS.)

Coulomb's law - Coulomb's law: Vector form - The electric field - The electric field of point charges-The Electric dipole – Electric field of continuous charge distributions- A Uniform line of charge – A uniform ring or disk of charge – An infinite sheet of charge – A uniform spherical shell of charge – Electric field lines - A dipole in an electric field

UNIT –II GAUSS'S LAW, ELECTRIC POTENTIAL ENERGY AND ELECTRIC POTENTIAL (18 HRS.)

Gauss's law- Gauss's law and Coulomb's law-Applications of Gauss's law – Infinite line of charge – Infinite sheet of charge- A spherical shell of charge

Electric potential –Calculating the potential from the field – Potential due to point charges – Potential due to electric dipole - Electric potential of continuous charge distributions–A uniform line of charge – A ring of charge –

A charged disk - Equipotential surfaces

UNIT –III THE MAGNETIC FIELD, THE MAGNETIC FIELD OF A CURRENT (15 HRS.)

Magnetic interactions and magnetic poles - Magnetic force on a moving charge - Circulating charges –cyclotron - The Hall effect – Magnetic force on a current carrying wire– Torque on a current loop. The magnetic field of a current- A straight wire segment – A circular current loop - Ampere's law- Applications of Ampere's law

UNIT –IV FARADAY'S LAW OF INDUCTION, MAGNETIC PROPERTIES OF MATERIALS (15 HRS.)

Faraday's experiments – Faraday's law of induction – Lenz's law – Motional emf – Eddy currents - Generators and motors.The magnetic dipole –The force on a diole in a nonuniform field- Atomic and nuclear magnetism – Magnetization – Magnetic materials: Paramagnetism – Diamagnetism- Ferromagnetism-Gauss's law for magnetism.

UNIT –V MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES (15 HRS.)

The basic equations of electromagnetism- Induced magnetic field and displacement current- Maxwell's equations- Generating an electromagnetic wave- Traveling waves and Maxwell's equations- Energy transport and Poynting vector.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Invention of Leyden jar, Formulation of quantitative laws of electrostatics and magnetostatics,Development of electromagnetic technology

REFERENCES:

1. David Halliday, Robert Resnick & Kenneth S. Krane , *Physics – Volume II*, Fifth edition, (John Wiley and sons, Inc.) (Relevant sections in all Chapters)
2. Tiwari K, *Electricity and Magnetism*, S. Chand & Co.
3. Dayal D. C., *Electricity and Magnetism*, IV edition, Himalaya Publishing House, Bombay.

4. Sehgal, Chopra and Sehgal, *Electricity and Magnetism*, Sultan Chand and Sons, New Delhi

WEB REFERNCES :

1. http://www.gutenberg.org/ebooks/34221
2. https://bookboon.com/en/university-physics-ii-notes-and-exercises-i-ebook

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Derive electric field for a distribution of charges by applying method of calculus
CO 2	Evaluate electric field for problems involving symmetry by using Gauss's law
CO 3	Estimate the magnetic field of a current using Biot Savarat law and Ampere's law
CO 4	Describe the working of generators and motors based on Faraday's law of induction and Lenz law. Also, they will be able to classify magnetic materials based on magnetic dipole moments
CO 5	Comprehend Maxwell's equations and generation of electromagnetic waves

II B.Sc.

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P3CC8	Solid State Physics	LECTURE	4	3

COURSE DESCRIPTION

Aim of this course is to enable the student to understand the concepts in crystal structure and magnetic and dielectric materials which forms the basis for material world.

COURSE OBJECTIVES

Solid State Physics is basic for material fabrications for various electronic applications. This course aims at giving an idea about crystal structure and various properties of solids like magnetic and dielectric behaviours. This course also deals with the super conductors and their applications.

UNIT I: CRYSTAL STRUCTURE [12 HRS.]

Introduction – crystal lattice and translation vectors-unit cells- basis-symmetry operation-point groups-space groups-types of lattices- lattice directions and planes- interplanar spacing-simple crystal structures-structure of diamond-zinc blende structure and sodium chloride structure

UNIT II: LATTICE VIBRATIONS [14 HRS.]

Introduction-vibration of one dimensional monoatomic lattice-vibration of one dimensional diatomic lattice-phonons-momentum of phonons-inelastic scattering of photons by phonons-specific heat-classical theory of lattice heat capacity- Einstien's theory of lattice heat capacity

UNIT III: MAGNETISM IN SOLIDS (10 HRS.)

Magnetic terminology - types of magnetism - diamagnetism, Langevin's Classical theory – paramagnetism - Langevin's Classical theory ferromagnetism- Concept of Domains an Hysteresis - antiferromagnetism - ferrimagnetism

UNIT IV: DIELECTRIC PROPERTIES OF SOLIDS (12 HRS.)

Polarization and susceptibility- the local field-dielectric constant and polarizability-sources of polarizability-Electronic Polarizability- Ionic Polarizability – Dipolar Polaizability - frequency dependence of total polarizability - ferroelectricity- Piezo electricity

UNIT V: SUPER CONDUCTIVITY (12 HRS.)

Introduction and historical development- electrical resistivity- prefect diamagnetism or meissner effect-super current and penetration depth-critical field and critical temperature-type I and II superconductor- thermo dynamical and optical properties-isotope effect-flux quantization- the Josephson effects and tunneling -additional characteristics - theoretical aspects-high temperature ceramic superconductors-applications.

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Applications of crystals in solar cell - Application of super conductor in MRI body scanner.

REFERENCES

2) R.K.Pure and V.K.Babber "Solid State Physics" First Edition 1997, S.Chand.
3) S.O.Pillai "Solid state Physics" Second Edition 2009, New Age International Publishers.
4) Charles Kittel " Introduction to Solid state Physics" First Edition 2018, Wiley Publishers.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Define the different parameters of crystal system and explain the basic concepts.
CO 2	Describe the various magnetic behaviours of solids
CO 3	Explain the working of dielectric materials.
CO 4	Understand the basic concepts in super conductivity.
CO 5	Describe working and various applications of superconductors.

II B.Sc.

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P3CC9	Major Practicals III	Major Core-Practicals	3	2

COURSE DESCRIPTION

This laboratory course explores the basic principles of electricity and magnetism through experiments

COURSE OBJECTIVES

On completion of this course, the learner will be able to understand electric and magnetic laws using appropriate equipments through experiments

List of Experiments (Any Eight)

1. Series Resonance- LCR circuit
2. De Sauty's Bridge
3. Calibration of ammeter using potentiometer
4. Calibration of low range voltmeter using potentiometer
5. Field along the axis of the coil – Determination of M & H
6. Parallel Resonance – LCR circuit
7. Calibration of high range voltmeter using potentiometer
8. Owen's bridge
9. Comparison of EMF of two cells using spot galvanometer
10. Comparison of capacitances of two capacitors using spot galvaotnometer

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Understand and Analyse electric, magnetic and electromagnetic principles and laws through experiments

II B.Sc Mathematics (Reg) & (SF)

SEMESTER - IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19M3ACP1& 19G3ACP1	ALLIED PHYSICS-I	LECTURE	3	3

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like Waves and Oscillations, Properties of matter, Electricity and Magnetism and Geometrical Optics.

COURSE OBJECTIVES

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Simple Harmonic motion, Elasticity of solid matters, viscosity of liquids and thermal properties of Gas, magnetic effect of electric current, Refraction, dispersion of optical devices.

UNIT I: WAVES AND OSCILLATIONS [9HRS]

Simple Harmonic motion- Composition of two simple harmonic motions in a straight line-Composition of two simple harmonic motions of equal time periods at right angles-Lissajous's figures- Uses– laws of transverse vibrations of strings – Melde's string – transverse and longitudinal modes.

UNIT –II PROPERTIES OF MATTER [9HRS]

Elasticity –Different Moduli of Elasticity- Poisson's ratio.

Streamline flow and Turbulent flow–Coefficient of Viscosity-Rate of Flow of liquid in a Capillary Tube- Poiseuille's Formula (Method of dimensions) - Poiseuille's Method for determining coefficient of viscosity of liquid- Comparison of viscosities of two liquids.

Surface Tension: Molecular theory of surface tension-pressure difference across a liquid surface-Excess Pressure inside a liquid drop- Excess pressure inside a soap bubble.

UNIT –III THERMAL PHYSICS [9HRS]

Postulates of Kinetic theory of gases – Van der Waals equation of state – Derivation of Critical Constants - Joule Kelvin effect – Joule Thomson porous plug experiment –Laws of thermodynamics- Heat Engine– entropy - changes of entropy in reversible and irreversible processes.

UNIT –IV ELECTRICITY AND MAGNETISM [9HRS]

Capacitor-energy of charged capacitors -Loss of energy on sharing of charges between two capacitors- magnetic effect of electric current-Biot Savart's law-Magnetic induction at a point on the axis of a circular coil.

UNIT –V GEOMETRICAL OPTICS [9HRS]

Laws of Refraction – Refractive index by travelling microscope, Refraction through Prism - Dispersion through a prism – Expression for dispersive power of the material of a thin prism – Combination of two prisms to produce dispersion without deviation - Combination of two prisms to produce deviation without dispersion.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) [2HRS]

New droplet-based electricity generator - The impact of magnetic materials in renewable energy

REFERENCES:

2. Allied Physics by R.Murugeshan (2012- I Edition) *Allied Physics,* Ram Nagar, New Delhi: S. Chand & Company Ltd.

WEB REFERNCES :

1.**https://study.com/academy/lesson/physical-property-of-matter-definition-examples- quiz.html**
2.**https://www.physicsforums.com**
.**https://www.kullabs.com/classes/subjects/units/lessons/notes/note-detail/1761**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Define and discuss about the simple harmonic waves and its oscillations and laws of transverse vibrations of strings.
CO 2	Classify and describe the properties of matter such as electricity, viscosity and surface tension.
CO 3	Summarise the basic concepts of thermal physics and apply the laws of thermodynamics in higher learning concepts such as entropy and its reversible and irreversible process.
CO 4	Explain the principles and laws used in electricity and magnetism those are useful in defining the energy of a capacitor and magnetic effect of electric current.
CO 5	Demonstrate the properties of geometrical optics and explain the refraction and dispersion through a prism.

II B.Sc Mathematics (Reg) & (SF)

SEMESTER - IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19M3ACP2& 19G3ACP2	ALLIED PHYSICS PRACTICALS -I	PRACTICAL	2	2

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied core courses.

COURSE OBJECTIVES

This course enables the students to develop basic lab skills.

LIST OF EXPERIMENTS

1. Comparison of coefficient of viscosity of two liquids
2. Determination of coefficient of viscosity
3. Determination of Surface Tension – Capillary rise method
4. Determination of Surface Tension – Drop Weight method
5. Determination of Latent heat of fusion of Ice
6. Determination of Young's Modulus - Uniform bending (optic lever)
7. Determination of specific heat capacity of a liquid-Newton's law of cooling
8. Determination of focal length of biconvex lens (UV& Distant object Methods).
9. Determination of refractive index of liquid
10. Determination of rigidity modulus – Torsion Pendulum

II B.Sc.

SEMESTER –III

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P3SB1	Biomechanics	Skill Based	2	2

COURSE DESCRIPTION

This course aims to introduce the Biomechanical concepts and to provide an idea about the anatomic pulleys and lever systems.

COURSE OBJECTIVES

This course imparts knowledge about mechanics applied to Biological systems.

UNIT-I INTRODUCTION TO BIO MECHANICS (4 HRS.)

Mechanics – Classifications - Meaning of biomechanics - basic concepts - Principle areas of biomechanics

UNIT –II BIOMECHANICAL CONCEPTS (7 HRS.)

Kinematics: Primary variables- Time-Position-Displacement-Velocity-Acceleration. Kinetics- Force related Concepts- Mass and Inertia—Force-Force systems- Center of Mass-center of gravity-Pressure-Moment of Force (torque)- Mass moment of inertia.

UNIT –III NEWTONS LAW OF MOTION [6 hours]

Newton's First law of motion- Newton's second law of motion- Newton's third law of motion- Equilibrium-Work and Power-join mobility and stability.

UNIT-IV LEVER SYSTEM [6 hours]

Resistance force- Effort force. Classes of levers- first, second and third classes-function of levers-moment of force and joint motion- joint reaction forces

versus bone on bone forces-joint lubrication

UNIT-V: MUSCLE FORCES [7hours]

Total muscle force vector- Continuing Exploration: Measuring muscle force- anatomic pulleys, action lines and moment arms- changes to moment arm of a force- moment arm and angle of application of force- muscles in third class, second class and first class lever systems – mechanical advantage.

REFERENCES:

1. William C. Whiting, Ronald F. Zernick (Human Kinetics), Biomechanics of Musculoskeletal Injury.
2. Pamela K, Levangie, Cynthia C. Norkin (JP brothers, New Delhi) Joint Structure and Function: A Comprehensive analysis (IV Edition).
3. Ronald.L.Huston, Fundamentals of Biomechanics, 2013, (V Edition).

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Acquire a skill to apply the laws of kinematics to biological systems
CO 2	Identify the anatomical pulleys and lever systems
CO 3	Access the types of levers in our body
CO 4	Explain how the biological machines inside our body
CO 5	Discuss different kinds of activities, equilibrium and stability of the body using law of physics

II B.Sc.

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19P4CC10	Analog Electronics	LECTURE	5	5

COURSE DESCRIPTION

The course provides an exposure to transistors, amplifiers, oscillators and operational amplifers

COURSE OBJECTIVES

This course deals with fundamentals and working of electronic devices and its applications

UNITS

UNIT –I SEMICONDUCTOR DIODE (12 HRS.)

PN junction – junction theory –The ideal diode-Static and dynamic resistance of a diode- Use of diodes in rectifiers- Half wave rectifier – Full wave rectifier - Efficiency of rectifiers to convert AC into DC – Shunt capacitor filter – Choke input LC filter – π filter-types of diodes

UNIT –II TRANSISTOR (BJT & FET) (18 HRS.)

Transistor characteristics – Common base (CB) configuration – Common emitter (CE) configuration – Common collector (CC) configuration – comparison between the three configurations – Reason for CE configuration is widely used in amplifier circuits – Basic CE amplifier circuit – DC load line – Amplifier analysis using DC load line - Field Effect Transistor (FET). Structure of a junction field effect transistor – JFET characteristics – JFET parameters

UNIT –III SMALL SIGNAL AMPLIFIERS & MULTISTAGE AMPLIFIERS

(15 HRS.)

Single stage transistor amplifier – Equivalent circuit method: Development of Transistor ac equivalent circuit, h-parameter equivalent circuit, amplifier analysis. Need of Multistage Amplifiers – Gain of a multistage amplifier – Coupling of two stages: Resistance- Capacitance coupling-Frequency response curve of an RC coupled amplifier: fall of gain in low frequency range, fall of gain at high frequencies, band width of an amplifier

UNIT –IV FEEDBACK IN AMPLIFIERS & OSCILLATORS (15 HRS.)

Concept of feedback in amplifiers – Types of feedback – Voltage gain of feedback amplifier. Positive feedback amplifiers as an oscillator – LC oscillators: tuned collector oscillator, **tuned base oscillator**, Hartley oscillator, **Colpitts oscillator** – RC oscillators (no derivation): phase shift oscillator, Wein bridge oscillator –Astable multivibrators.(circuit using transistor only)

.UNIT –V OPERATIONAL AMPLIFIER (15 HRS.)

The operational amplifier (OP-AMP) – Basic concepts- Ideal op-amp-Characteristics of an OP-AMP- Operational amplifiers: Basic inverting OP-AMP, Practical inverting OP-AMP, Non inverting OP- AMP ,parameters of OP-AMP -Applications of OP-AMP: **Scale changer, phase shifter, Summing amplifier**, Integrator, Differentiator.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Power Electronics-Electronics technology

REFERENCES:

1. Bhargava N N, Kulshreshtha D C, Gupta S.C., *Basic Electronics and linear circuits* Tata McGraw Hill Publishing Company Ltd.

2. Gupta S.L, Kumar V, *Hand Book of Electronics*- -20th edition- Pragati Prakashan Publications.

WEB REFERNCES :

5) http://hyperphysics.phystr.gsu.edu/hbase/magnetic/magcur.html
6) https://www.britannica.com/science/electromagnetism

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Acquire basic knowledge of PN junction diode,different rectifiers and filters
CO 2	Explain different transistor configuration and various biasing circuits
CO 3	Obtain the knowledge of transistor amplifier and analyse using DC and AC load line
CO 4	Elucidate the concept of feedback in amplifiers and design various types of oscillators
CO 5	Describe the parameters of OP-AMP and to design OP-AMP circuits

II B.Sc.

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P4CC11	MATERIALS SCIENCE	LECTURE	4	4

COURSE DESCRIPTION

The course provides concept based exposure to conducting, dielectric, magnetic, superconducting and other emerging new materials

COURSE OBJECTIVES

This course deals with the elemental concepts of properties of various materials

UNITS

UNIT –I CONDUCTING MATERIALS (12 HRS.)

Material Science-Properties of engineering materials.

Atomic interpretation of ohm's law-Relaxation time and electrical conductivity-Derivation of electrical conductivity of a metal-Electrical and thermal conductivity-Thermal conductivity-Wiedemann Franz law-Thermal expansion-Different types of conducting materials:Low resistivity materials, High resistivity materials

UNIT –II DIELECTRIC MATERIALS (12 HRS.)

Fundamental definitions in dielectrics-Determination of dielectric constant of a dielectric material- Applications of insulating and dielectric materials - Properties and different types of insulating materials

UNIT –III MAGNETIC MATERIALS (12 HRS.)

Introduction - Different types of magnetic materials- Soft Magnetic materials-

Hard magnetic materials-Energy product of magnetic materials-Ferrite Core memory-Magnetic recording materials-Magnetic storage media materials-Magnetic principle in computer data storage

UNIT –IV SUPERCONDUCTING MATERIALS (12 HRS.)

Introduction - Explanations for the occurrence of superconductivity-General properties of superconductors-Other observations-Types of superconductors-High temperature superconductors-Preparation & Characterisation of high temperature ceramic superconductors-Perovskite superconductivity-Applications of superconductors

UNIT –V NEW MATERIALS (12 HRS.)

Metallic glasses-fiber reinforced plastics- Metal matrix composites – Biomaterials-Ceramics-Cermets-High temperature materials-Thermoelectric materials-Electrets-Nanophase materials-Shape memory alloys-smart materials-conducting polymers.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

New Materials invented in twentieth century that could change human lives

REFERENCES:

1. Dr. M. Arumugam, M. Sethuraman, *Material Science*, Anuradha publications, Reprint 2010

1. V. Rajendran, *Material science*, TATA Mc GRAW HILL EDUCATION PVT. LTD. Second Reprint 2013

2. William.D. Callister, Jr., *Materials science and Engineering* – an introduction (V edition) 2012

WEB REFERNCES :

1. https://easyengineering.net/materialssciencebooks/
2. https://electronicsforu.com/resources/16-free-ebooks-on-material-science

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Explain the classical Maxwell's distribution law of velocity and its inference.
CO 2	Determine electrical conductivity, thermal conductivity of conducting materials
CO 3	Gain the knowledge of properties of various materials
CO 4	Explain theory of various magnetic and superconducting materials
CO 5	Identify new materials that find diverse applications.

II B.Sc.

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P4CC12	MAJOR PRACTICALS IV	Practicals	3	2

COURSE DESCRIPTION

This laboratory course explores the basic principles of electronics through experiments

COURSE OBJECTIVES

On completion of this course, the learner will be able to understand physical laws using appropriate equipments through experiments

List of Experiments

1. Bridge Rectifier-study of percentage of regulation
2. Transistor characteristics – CE configuration
3. Single Stage RC coupled Amplifier-Study of frequency response curve
4. OP-AMP –Inverting amplifier, Differential amplifier
5. OP-AMP - Adder and Subtractor
6. OP-AMP-Parameters
7. Low pass & High pass filter using RC circuit
8. Zener diode characteristics
9. Hartley Oscillator
10. Colpitt Oscillator

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Understand and electronics principles and laws through experiments

II B.Sc Mathematics (Reg) & (SF)

SEMESTER – IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19M4ACP3 & 19G4ACP3	Allied Physics-II	LECTURE	3	3

COURSE DESCRIPTION

The course provides a conceptually based exposure to the fundamental principal and processes of significant topics of physics like geometrical Optics, Atomic Physics, Nuclear Physics and Electronics

COURSE OBJECTIVES

This course will improve the elemental concepts and enhance the intellectual, experimental, analytical skills of the students on Atomic Physics, Nuclear Physics, Electronics and Physical optics.

UNITS

UNIT I: PHYSICAL OPTICS (9 HRS.)

Velocity of light-Michelson's method-Interference in thin films-Production of colours in thin films-Air wedge-Diffraction- Polarisation- Polarisation by reflection-Double refraction –Nicol Prism.

UNIT II: ATOMIC PHYSICS (9 HRS.)

Introduction – Rutherford's experiments on scattering of alpha particles- Bohr atom model – Bohr formula – calculation of total energy – Bohr's Interpretation of Hydrogen spectrum – Spectral series of hydrogen atom .

UNIT III: NUCLEAR PHYSICS (9 HRS.)

Models of Nuclear Structure -The Liquid Drop Model-Mass defect-Binding energy- Nuclear fission-chain reaction - atom bomb-energy released in fission - Nuclear reactor-Nuclear Fusion.

UNIT IV: BASIC ELECTRONICS (9 HRS.)

Formation of p-n Junction Diode-Forward and Reverse Biasing of a Junction Diode-V-I Characteristics of a Junction Diode-The Zener Diode-Experiment to study the characteristics of Zener diode-Junction Transistor-working of NPN transistor - common emitter characteristics of a transistor.

UNIT V: DIGITAL ELECTRONICS [9 HRS]

Decimal Number system- Binary Number system-conversion of Binary number into decimal number-conversion of decimal number into binary number- Octal Number system-Hexadecimal number system – Boolean Algebra-Boolean addition and multiplication-Logic Expressions-commutative laws-associative laws-distributive law-Rules for Boolean algebra-De Morgan's Theorem

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Role of Michelson interferometer in Atmospheric and space applications **-** Working of pocket calculators, and cd players

REFERENCES

3. R.Murugesan "Allied Physics" Second Edition 2012, Ram Nagar, New Delhi: S. Chand & Company Ltd.
4. R. Murugeshan & Kiruthiga Sivaprasath "Modern Physics" 2007,S.Chand & Company Ltd., 2007.

WEB REFERENCES (OPTIONAL)

1. https://www.khanacademy.org/science/physics/quantum-physics/atoms-and-electrons/v/atomic-energy-levels
2. https://www.nature.com/subjects/nuclear-physics
3. https://www.dictionary.com/browse/physical-optics

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Categorize and clarify the different optical phenomena of interference, diffraction, polarization.
CO 2	Explain the atom model and calculate the total energy of an atom and account for the spectral series of hydrogen $_{atom}$.
CO 3	Elucidate the models of nuclear structure and to learn the principle behind atom bomb, nuclear reactors.
CO 4	Summarize the working principle of p-n junction diode in forward and reverse biasing, it's V-I characteristics, the Zenor Diode, n-p-n transistor in common emitter characteristics.
CO 5	Classify the number system and demonstrate the skill in conversion of Number systems, Boolean algebra and its associated laws.

II B.SC Mathematics(Reg)&(Sf)

SEMESTER IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19M4ACP4& 19G4ACP4	ALLIED PHYSICS PRACTICALS -II	ALLIED CORE	2	2

COURSE DESCRIPTION

The course provides hands on training in Physics experiments relevant to the theory learnt in allied courses.

COURSE OBJECTIVE/S

This course enables the students to develop basic lab skills.

LIST OF EXPERIMENTS (Any eight)

1. Low range Voltmeter calibration using Potentiometer
2. Air wedge - Determination of thickness of insulation
3. Diode characteristics – (Forward & Reverse bias)
4. Ohm's law verification
5. Bridge rectifier
6. Verification of AND, OR, NOT, NAND and NOR gates
7. Verification of Boolean expressions
8. NAND as universal gate
9. NOR as universal gate
10. De Morgan's theorems

II B.Sc.

SEMESTER –IV

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19P4SB2	Physics of Stars	Lecture	2	2

COURSE DESCRIPTION

This course briefly explains the life cycle of a star. It throws light on various nuclear reactions taking place in a star. It also explains about the mysterious objects of the Universe.

COURSE OBJECTIVES

This course impart knowledge about physics of stars and other mysterious objects of Universe

UNITS

UNIT-I THE STARS IN THE SKY (5 HRS.)

Life cycle of the stars – The black body model of a star – Morgan – Keenan spectral classification of stars

UNIT –II LUMINOSITY RELATION (5 HRS.)

Hertzsprung – Russel diagram –Mass Luminosity relationship of a star in the main sequence – The size limits of a star.

UNIT –III THE LIFE OF STARS IN THE MAIN SEQUENCE (8 HRS)

The stellar structures – The stellar models – The energy transport mechanism inside a star – The main sequence and life span of the stars – Nuclear reactions inside a main sequence star– The Proton – proton chain reaction – The Carbon – Nitrogen – Oxygen cycle.

UNIT-IV : MYSTERIOUS OBJECTS OF THE UNIVERSE (6 HRS)

Brilliant Phenomena and Mysterious Objects of the Universe - Supernova – Type I supernova – Type II supernova.

UNIT-V: COMPACT OBJECTS OF THE SKY (6HRS)

Compact Objects of the sky - White dwarfs - Neutron stars- Pulsars - Black holes - Quasars- Evidences of dark matter - Gravitational lensing.

REFERENCES:

1. Astronomy and AstroPhysics- Asit Baran Bhattacharya, Shubhendu Joardar & Rina Bhattacharya
2. Astrophysics for Physicists by Arnab Rai Choudhuri, Cambridge Universit y Press

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	On completion of the course, the student will be able to explain the life cycle of stars
CO 2	Students will be able to discuss the spectral classification of stars
CO 3	Students will be able to outline the nuclear reactions taking place in stars
CO 4	Students will be able to distinguish between various mysterious objects of the universe like supernova, white dwarfs, pulsars, red giants, black holes etc
CO 5	Students will be able to explain classification of galaxies, red and blue shift of spectral lines

III B.Sc.

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	P5CC13	DIGITAL ELECTRONICS AND COMMUNICATION	Core	6	5

COURSE DESCRIPTION

This course is designed to impart depth knowledge on combinational logic circuits, flip-flops, registers and counters, digital-analog conversion, different modulation techniques of communication systems and satellite communications.

COURSE OBJECTIVES

This course will enhance the vital concepts and improve the analytical, planning and application of acquired knowledge in logic design and simplification, use of registers and counters, simultaneous and continuous conversion of A/D systems, modulations involved in the communication systems.

UNIT I: COMBINATIONAL LOGIC CIRCUITS, FLIP-FLOPS (20 hrs)

Boolean laws and theorem - Sum-of- products method - Truth table to Karnaugh Map - Pairs, Quads and Octets (Self Study) - Karnaugh simplifications, **Don't care conditions (Self Study)** - Product –of- sums method - product-of-sum simplification.

RS flip-flops- Gated flip flops – Edge triggered RS flip flop- Edge triggered D-flip-flops-Edge triggered JK flip-flops-**Flip-flop Timing (Self Study)** - Edge triggered D-flip-flops-JK master-slave flip-flop.

UNIT II: SHIFT REGISTERS & COUNTERS (18 hrs)

Types of registers -Serial in- serial out - Serial in-parallel out-Parallel in – serial out – **parallel in- parallel out (Self Study)** .
Asynchronous counters – decoding gates - synchronous counters – changing the counter modulus – decade counters.

UNIT III: D/A CONVERSION AND A/D CONVERSION (16hrs)

Variable resistor networks – binary ladders –**D/A converters (Self Study**) – A/D converter- Simultaneous conversion – continuous A/D conversion – A/D techniques.

UNIT IV: MODULATION (18hrs)

Introduction – Modulation- forms of modulation- Amplitude modulation-AM transmitter and receiver (block diagram only) – Side band transmission **Generating the side bands only (filter method) (Self Study)** – Frequency modulation – Direct Frequency modulation – Phase modulation - FM transmitter and receiver (block diagram only).

UNIT V: DIGITAL MODURLATION & SATELLITE COMMUNICATIONS (18 hrs)

Pulse amplitude modulation – Time division multiplexing – Pulse width modulation (brief theory only) – Pulse position modulation (brief theory only).

SATELLITE COMMUNICATIONS: Introduction- The satellite orbits-**satellite position (Self Study) -** the uplink, the down link, the cross link, **assignable satellite frequencies (Self Study)** - Station keeping.

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Applications of flip-flops in real life appliances – Modulation in mobile communication.

REFERENCES

1. Digital integrated electronics – H. Taub and D. Schilling (1977- I Edition) McGraw-Hill

2. Electronic Communication system – George Kennedy. (2011 – V Edition) McGraw-Hill

III B.Sc. PHYSICS

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P5CC14	OPTICS	LECTURE	5	4

COURSE DESCRIPTION

This course aims at giving a detailed study of interference, diffraction, polarization, Holography, Laser and Maser.

COURSE OBJECTIVES

The course enables the students to understand and analyse the interference of light waves and to study the characteristics of Laser and the applications of Laser. This course explains the diffraction patterns using different types of obstacles and distinguish Fresnel and Fraunhofer diffraction pattern. This course analyses the resolving power of Prism, Grating, Microscope and Telescope and explain the production and detection of polarized light.

UNIT –I INTERFERENCE OF LIGHT (division of amplitude) (15 HRS)

Change of phase on reflection- Interference by reflected light- Interference by transmitted light- **Colors of thin films**-Non-reflecting films- Interference in a wedged-shaped film- Fringes in white light- **Fringes of equal thickness and fringes of equal inclination** (**self study**)- Newton's rings by reflected light- Newton's rings by transmitted light.

UNIT –II INTERFERENCE OF LIGHT(DIVISION OF WAVEFRONT(15 HRS)

Fresnel's biprism- Interference fringes with white light- Displacement of the fringes- Fresnel's double mirror

Lasers and Holography

Introduction to Lasers: Absorption, Spontaneous emission and Stimulated emission-Relation between Einstein's A&B coefficients – Characteristics of a Laser beam-Principle of Laser action- Helium Neon Laser –Semi conductor Lasers-Applications of a Lasers: **Lasers in medicine and surgery(self study)** - Laser in Holography.

UNIT –III DIFFRACTION OF LIGHT- FRESNEL CLASS (15 HRS)

Introduction- -Difference between Fresnel and Fraunhofer diffraction- Difference

between Interference and Diffracion-Fresnel's assumptions- Fresnel's half period zones for plane waves- Explanation of rectilinear propagation of light-Zone plate - Diffraction at a circular aperture- Diffraction at an opaque disc -Diffraction at a straight edge - **Diffraction at a slit (self study)**

UNIT –IV FRAUNHOFER DIFFRACTION (15 HRS)

Fraunhofer diffraction at a single slit- Two slits – N parallel equidistant slits- plane diffraction grating- Determination of wavelength of light with a plane transmission grating- Dispersive power of a diffraction grating- Resolving power – Rayleigh's criterion for resolution- Resolving power of telescope, **Resolving power of Microscope (self study)**, Grating, Prism.

UNIT –V POLARIZATION OF LIGHT (15 HRS)

Polarized and unpolarised light – Production of plane polarised light – Polarization by reflection-Brewster's law- Polarisation by refraction through pile of Plates- Law of Malus- **Uniaxial and biaxial crystals(self study)** – Double refraction-Polarisation of Double Refraction-Nicol Prism-Superposition of two disturbances-Quarter wave plate-Half wave plate- Production and analysis of polarized light.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (4 HRS.)

Michelson's interferometer, Cornu's spiral

REFERENCES:

1.Satya Prakash , Optics ,12th edition 2005, Educational & university Publishers.

1) Dr.N.Subrahmanyam, Brijlal, Dr.M.N.Avadhanulu, A text book of optics-24th Revised Edition 2010, S. Chand & Company limited.

2) Ajoy Ghatak, OPTICS –4th Edition, Tata Mc Graw Hill Publishing Company Ltd, New Delhi.

Web References

http://igorivanov.tripod.com/physics/optics.html
https://www.asc.ohio-state.edu/schumacher.60/class/780.il/references_book.html
http://www.lightandmatter.com/lm/

III B.Sc.

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P5CC15	Major Practicals V ELECTRONICS	Lab	3	2

COURSE DESCRIPTION

This laboratory course explores the basic principles of electronics through experiments

COURSE OBJECTIVES

On completion of this course, the learner will be able to understand physical laws using appropriate equipments through experiments

List of Experiments (Any Eight)

1.Regulated power supply using Zener diode
2.Regulated power supply using IC
3.Gates - using discrete components
4.Gates - using IC's
5.RS & JK Flip Flops using NAND Gates
6.RS & JK Flip Flops using NOR Gates
7.Half adder, Full adder using IC's
8.Half subtractor, Full subtractor using IC's
9.OP-AMP Parameters- Closed loop gain and output impedance
10.OP-AMP Parameters- Offset voltage and input impedance

III B.Sc.

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	P5CC16	Major Practicals VI NON ELECTRONICS	Practicals	3	2

COURSE DESCRIPTION

The lab course deals with Experiments of **optics, thermal and electricity** in Physics.

COURSE OBJECTIVES

The course gives an understanding of electrical, thermal and optical measurements like Refractive index of a liquid, Determination of wavelength of Fraunhofer lines using Grating, Determination of λ using Hartmann's Interpolation Formula, determination of μ by forming Newtens rings and characteristics of a thermistor.

List of Experiments

Any six experiments

1.He-Ne LASER- Determination of Refractive index of a liquid

2. Verification ofMalus law- LASER

3. Study of the Characteristics of a Thermistor.

4.Solar Spectrum - Determination of ofFraunhofer lines using Grating

5. Air Wedge – determination of thickness of wire

6. Determination of λ -Hartmann's Interpolation Formula

7. Biprism and spectrometer - Determination of λ

8.Newton's rings in liquid – determination of μ.

III B.Sc.

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	P5SB3	PHYSICS OF MEASURING INSTRUMENTS	LECTURE	2	2

COURSE DESCRIPTION

This course describes the basic principles of thermodynamical and pressure measurements, aircraft instrumentation.

COURSE OBJECTIVES

This course provides conceptual physics needed for measurement of various thermodynamic quantities like temperature, pressure , density and humidity. Also it introduces wind measurement techniques and mechanical and electrical measurements comprising of temperature transducers, biosensors, chemical and optical sensors.

UNITS

UNIT –I THERMODYNAMICAL MEASUREMENTS (6 HRS.)

Temperature: Average Body Temperature – Low body temperature on health **–**Basal body temperature thermometer –Swine flu thermometer –Bulb thermometer-Bimetallic strip thermometer-**digital thermometer**

UNIT –II ATMOSPHERIC PRESSURE AND HUMIDITY (6 HRS.)

Standard atmospheric pressure- Mean sea level pressure-Altitude atmospheric pressure variation- Local atmospheric pressure variation-Atmospheric pressure based on height of water.

Density**:** Change of density with pressure and temperature- Densities of various materials.

Hygrometer- Psychrometer- Difficulty of accurate humidity measurement-

Hair tension hygrometer- **Electronic hygrometer- Applications.**

UNIT –III AIRCRAFT INSTRUMENTATION: (6 HRS.)

Altimeter: Pressure altimeter- Radar altimeter-Other modes of transport: Measuring air pressure-Sattelite altimetry-Sextants: Navigational sextant- **Aircraft Sextant- Adjustment and care-Advantages**

UNIT –IV WIND SPEED MEASUREMENTS (6 HRS.)

Wind speed: Factors affecting wind speed- Design of structures considering Wind Speed.

Anemometers: Velocity anemometers: Windmill anemometer-Laser Doppler anemometer -Sonic anemometer_ Pressure anemometers**:** Plate anemometer-Tube anemometer- Effect of density on measurements:Other practical onsiderations**: Lightning-Precipitation-Low Temperatures.**

UNIT –V FORCE MEASUREMENTS- (6 HRS.)

Force: Force, Torque, Shaft power measurements-Scales and balances, Optical torsion meter, mechanical brakes-Car Brakes.

Transducers: Piezoelectric Trasnducers-Temperature transducers-Resistance temperature detectors- Thermistors-Ultrasonic termperature transducers- Photoelectric transducers- The photomultiplier tube- - The semiconductor photodiode- **The phototransistor-Biosensors-Chemical sensors-pH sensing-Optical sensors.**

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

REFERENCES:

1. Kumar,D.S.() *Mechanical measurements and Control* Metropolitan Book Co., II Edition.
2. Larry Jones, Foster Chin,A. () *Electronic insrtuments and measurements.* J.Wiley & sons, Inc.

III B.Sc

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P5SB4	PHYSICS OF MEDICAL INSTRUMENTS	LECTURE	2	2

COURSE DESCRIPTION

This course emphasise the basic concepts and applications of Medical instruments which involves Keratometer, Opthalmoscope , electromyogram, ECG, EEG, Electroretinogram, Cardio vascular Instrumentation- Bio potential of heart, Pacemakers and Angiography

COURSE OBJECTIVES

This course provides the medical foundation required for the diagnostic and therapeutic applications of various medical instruments.

UNITS

UNIT –I The breathing mechanism **(6HRS.)**

The breathing mechanism-Physics of some common lung diseases-Blood pressure and its measurement- Spicomanometer,

UNIT –II Sound in Medicine **(5 HRS.)**

Sound in Medicine**:**Diagram,Principle,construction,working of Stethoscope.

UNIT –III Light in Medicine**:** **(5 HRS.)**

Light in Medicine**:** - Applications of different types of Lasers in Medicine

UNIT –IV Instruments used in Opthomology **(6 HRS.)**

Instruments used in Opthomology, Keratometer, Opthalmoscope

UNIT –V Electricity within the body: **(8HRS.)**

Electrical potentials of Nerves - The electromyogram, ECG, EEG, Electroretinogram, Cardio vascular Instrumentation- Bio potential of heart, Pacemakers, Angiography

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

Diagnostic and therapeutic uses of all medical instruments

REFERENCES:

BOOKS FOR STUDY

1.John R. Cameron, James G. Skofronick- Medical Physics, John Wiley & Sons

2.IrinaCromwell,CarolWeibell,LiannePfeiffer-Biomedical Instrumentation and Measurements-Prentice Hall of India Pvt .Ltd., New Delhi

III B.Sc.

SEMESTER –V

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	19UGSLP1	Nanoscience and Nanotechnology	Core	-	2

COURSE DESCRIPTION

The objective of this course is to understand the basics of nanoscience and nanotechnology

COURSE OBJECTIVES

The course enables the student to understand the field of nanoscience and nanotechnology and to study the structure probing method. This course aids the student to gain knowledge about carbon nanotubes and to discuss briefly the evolving nanobiology, nanosensors, nanomedicines and nanomachines

UNIT I: INVESTIGATING MATERIALS IN THE NANOSCALE [12 HRS.]

Introduction –The Canvas of nano – Nano and nature – Our technologies and the world we live in – Nano- the Beginning. ntroduction – Electron Microscopies – scanning electron microscopy (upto SEM modern advances only)

UNIT II: CARBON NANOTUBES [12 HRS.]

Carbon nanotubes – Introduction – Synthesis and purification - Transport properties – Mechanical properties - Physical properties – Applications

UNIT III: NANOBIOLOGY [12 HRS.]

Introduction –Interaction between Biomolecules and Nanoparticle surfaces – Applications of nano in Biology – Biological Imaging using Semiconductor naocrystals – Immuno Fluorescent Biomarker Imaging _ Immunogold Labeling

UNIT IV: NANOSENSORS [12 HRS.]

Nanosensors – Introduction- What is Sensor? – Nanosensors – What makes them possible? Molecular Nanomachines – Introduction (only)

UNIT V: NANOMEDICINES [12 HRS.]

Introduction – Approach to developing Nanomedicines – Various kinds of Nanosystems in use –Nanoshells, Nanopores - Tectodendrimers

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Nanorobots: Future artificial intelligence devices

REFERENCES

1. Pradeep T "Nano: The Essentials-Understanding Nanoscience and Nanotechnology" Tata Mc Graw Hill Education private Limited, New Delhi

III B.Sc

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P6CC17	THERMODYNAMICS &STATISTICAL MECHANICS	UG core	5	4

COURSE DESCRIPTION

The aim of this course is to deal with thermodynamics, entropy and thermodynamic potentials. This course also deals with statistical thermodynamics and applications of statistics to gases.

COURSE OBJECTIVES

This course enables the student to understand and analyze the zeroth and first law of thermodynamics. This course explains the second law thermodynamics and deduce the Tds eauations. Also deduce the thermodynamic potential, Maxwell relations, Clausius Clapeyron equation to analyse the pressure variation with temperature. This course helps the students to distinguish the three statistics and to calculate thermodynamic probability of the macrostate and also to study the applications of statistics to gases and other systems.

UNITS 6

UNIT –I CONSEQUENCES OF THE FIRST LAW (15 HRS)

Scope of thermodynamics – Thermodynamic systems- State of a system, properties- pressure-Thermal equilibrium and temperature – the Zeroth law-Thermodynamic equilibrium- The first law of thermodynamics- the energy equation T and V independent - T and P independent**- P and V independent (self study)**.

UNIT –II ENTROPY AND THE SECOND LAW OF THERMODYNAMICS (15 HRS)

The second law of thermodynamics - Entropy – Calculations of entropy changes in reversible process - Temperature entropy diagrams-Entropy changes in irreversible processes- The Clausius and Kelvin- Plank statements of the second law.

Combined first and second laws:

Introduction- T and V independent- T and P independent- P and V independent- The T ds equations- **properties of a pure substance(self study)**- Properties of a Vander Waals gas.

UNIT –III THERMODYNAMIC POTENTIALS (15 HRS)

The Helmholtz function and the Gibbs function- Thermodynamic potentials- The Maxwell relations- **Phase transitions (self study)**- The Clausius-Clapeyron equation- The third law of thermodynamics.

UNIT –IV STATISTICAL THERMODYNAMICS (15 HRS)

Introduction- Energy states and energy levels- Macrostates and microstates- Thermodynamic probability- The Bose Einstein statistics- The Fermi-Dirac statistics- The Maxwell-Boltzmann statistics- The Bose- Einstein distribution function- The Fermi Dirac distribution function- **The Maxwell- Boltzmann distribution function(self study).**

UNIT –V APPLICATION OF STATISTICS TO GASES (15 HRS)

The Monoatomic ideal gas- The principle of equipartition of energy- The quantized linear oscillator- Specific heat capacity of a diatomic gas.

Applications of quantum statistics to other systems:

The Einstein theory of the specific heat capacity of a solid- The Debye theory of the specific heat capacity of a solid**- Blackbody radiation (self Study)**.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (4 HRS.)

Properties of an ideal gas , Specific heat capacity of a diatomic gas.

REFERENCES:

1. Francis W.Sears & Gerhard L.Salinger,Thermodynamics, kinetic theory and statistical thermodynamics, Narosa Publishing.
2. Agarwal, Eisner Statistical Mechanics, Wiley Eastern Ltd
3 . Reif ,Fundamentals of statistical and thermal physics,McGraw-Hill

Web References

http://igorivanov.tripod.com/physics/stat.html

http://igorivanov.tripod.com/physics/thermo.html

III B.Sc.

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	1P6CC18	Modern Physics	Major core	5	4

COURSE DESCRIPTION

This course is an informative and comprehensive course on modern physics encompassing the basic quantum mechanical properties of particles, nuclear models and special relativity.

COURSE OBJECTIVES

The objective of this course is to let the students to understand the key concepts of wave properties of particles and get exposed of the behavior of atoms, nuclei and particles through the basis of the Schrodinger equation. Also it introduces the vector atom model and accounts concisely the nuclear models and relativistic concepts.

UNITS

UNIT –I WAVE PROPERTIES OF PARTICLES (15 HRS.)

De Broglie waves – wave function - De Broglie wave velocity – Wave and group velocities - The Davisson – Germer experiment – The uncertainty principle – **Applications of the uncertainty principle (self study)** – The wave particle duality.

UNIT –II THE SCHRODINGER EQUATION (15HRS.)

The wave function – The wave equation – Time dependent form of Schrodinger's Equation – Probability current – Expectation values – Operators – The steady state form of Schrodinger's equation – Eigen values and Eigen functions – The particle in a box – energy quantization – **Momentum wave functions – Momentum quantization (self study)**

UNIT –III THE VECTOR ATOM MODEL (15 HRS.)

Magnetic quantum number – The Normal Zeeman Effect – Angular momentum – Electron spin – The Stern-Gerlach Experiment – Spin – Orbit coupling – **The Exclusion Principle – Hund's rule (self study)–** Total Angular momentum – LS coupling – jj coupling.

UNIT –IV THE NUCLEUS 15 HRS.)

Atomic masses – Nuclear electrons – The Neutron – Stable nuclei – Nuclear sizes – Binding Energy – The deuteron – Ground state of the deuteron – Triplet and singlet states – **Meson theory of nuclear forces (self study**) – The Liquid Drop Model – The Shell Model.

UNIT –V THEORY OF RELATIVITY (15HRS.)

Special theory of Relativity – The Michelson –Morley experiment – The Galilean Transformation – The Lorentz transformation – Lorentz – Fitzerald contraction – The time Dilation – Meson decay – Simultaneity – Space – Time – Velocity addition – The relativity of Mass - The Cerenkov effect – Mass and Energy – Some relativistic formulas – **General Relativity – The Twin Paradox (self study)**.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

Application of special theory of relativity and General theory of relativity: Global Positioning System (GPS)

REFERENCES:

Arthur Beiser (1968). *Perspectives of Modern Physics.* McGraw Hill.

Unit I: Ch.4: 4.1 - 4.8
Unit II: Ch.7: 7.1 – 7.9
Ch.8: 8.1 – 8.3
Unit III: Ch.9: 9.6 – 9.8
Ch.10: 10.1 – 10.3 , 10.6 – 10.9
Unit IV: Ch.21: 21.1 – 21.6
Ch.22: 22.1 - 22.6
Unit V : Ch.1: 1.1 – 1.8
Ch.2: 2.1 – 2.5, 2.7, 2.8.

Sehgal,N.K. Chopra, K.L and Sehgal,D.L (2004). *Modern Physics.* Sultan Chand and Sons.

Aruldas.G and Rajagopal.P (2005). *Modern Physics.* PHI Ltd

III B.Sc.

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P6CC19	Major Practicals VII ELECTRONICS	Major Practicals	3	2

COURSE DESCRIPTION

This laboratory course explores the basic principles of electronics through experiments

COURSE OBJECTIVES

On completion of this course, the learner will be able to understand physical laws using appropriate equipments through experiments

List of Experiments (Any Eight)

1.NAND & NOR as universal gates-IC
2.Karnaugh Map- Sum of products
3.Karnaugh Map- product of sums
4.Counters- Mod 3 using JK FF
5.Counters- Mod 5 and Mod 10 using 7490
6.OP-AMP – Integrator and differentiator
7.OP-AMP- Logarithmic Amplifier
8.Shift register- IC 74190
9.Ring Counter using JK FF
10.Verification of Boolean expressions and DeMorgan's theorem

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SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	P6CC20	Major Practicals VIII NONELECTRONICS	Major Lab	3	2

COURSE DESCRIPTION

The lab course deals with Experiments of **optics, thermal and electricity** in Physics.

COURSE OBJECTIVES

The course gives an understanding of electrical, thermal and optical measurements like Refractive index of a liquid, Determination of wavelength of Fraunhofer lines using Grating, Determination of λ using Hartmann's Interpolation Formula, determination of μ by forming Newtens rings and characteristics of a thermistor.

List of Experiments

Any six experiments

1.He-Ne LASER- Determination of Refractive index of a liquid

2. Verification ofMalus law- LASER

3. Study of the Characteristics of a Thermistor.

4.Solar Spectrum - Determination of ofFraunhofer lines using Grating

5. Air Wedge – determination of thickness of wire

6. Determination of λ -Hartmann's Interpolation Formula

7. Biprism and spectrometer - Determination of λ

8.Newton's rings in liquid – determination of μ.

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SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P6ME1	MicroProcessor	Major Elective	5	3

COURSE DESCRIPTION

Aim of this course is to enable the student to understand microprocessor architecture and assembly language programming

COURSE OBJECTIVES

UNIT I:Number systems and Microprocessor Architecture [15 HRS.]

Number inter conversion(decimal, hexa, binary and octal)

The 8085 microprocessor unit-microprocessor communications and bus timings(excluding timings diagram)-demultiplexing the bus AD_7-AD_0-generating control signals- the detailed look at the 8085 MPU and its architecture.

UNIT II: INTRODUCTION TO 8085 ASSEMBLY LANGUAGE PROGRAMMING [15 HRS.]

The 8085 programming model- instruction classification- instruction format- how to write, assemble and execute a simple program- overview of the 8085 instruction set.

UNIT III: INTRODUCTION TO 8085 INSTRUCTIONS [15 HRS.]

Data transfer operations- arithmetic operations- logic operations-branch operations- writing assembly language programs- debugging a program.

UNIT IV: PROGRAMMING TECHNIQUES WITH ADDITIONAL INSTRUCTIONS [15 HRS.]

Looping, counting and indexing- additional data transfer and sixteen bit arithmetic instructions-arithmetic operations related to memory- logic operations: rotate-logic operations: compare-dynamic debugging.

UNIT V COUNTERS AND TIME DELAY [15 HRS.]

Counters and time delay- illustrative program: hexa decimal counters- illustrative programs: Zero to Nine (modulo ten) counter- illustrative programs: Generating pulse waveforms

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only)

Interfacing Microcontrollers with external devices

REFERENCES

Ramesh S.gaonker, Microprocessor architecture, programming and applications with the 8085-III edition
Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186, 80286, 80386 and 80486, Prentice, Hall of India, New Delhi, third edition, 1995
Daniel Tabak, Advanced Microprocessors –
Douglas V. Hall, Microprocessor interfacing, Programming and Hardware, Tata McGraw Hill 2005.
S. Visvanathan and Vijayendran V., Fundamentals of Microprocessor 8086 , 3 rd Edition 2005 -

III B.Sc.

SEMESTER –VI

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P6ME2	Medical Physics	Core	5	5

COURSE DESCRIPTION

This course introduces physics of medical instruments used for diagnosis and therapy

COURSE OBJECTIVES

The course enables the students to understand the physics principles, methods and techniques in practice and research for diagnosis and treatment of human diseases with a specific goal of improving human health and well being

UNIT I: TERMINOLOGY, MODELING AND MEASUREMENT [15 HRS.]

Terminology, Modeling and Measurement - Applications of Electricity and Magnetism in Medicine: Electrical shock, High frequency Electricity in Medicine, Low-frequency Electricity and Magnetism in Medicine

UNIT II: LIGHT IN MEDICINE [15 HRS.]

Measurement of light and its units, Application of visible light in Medicine, Applications of Ultraviolet and Infrared Light in Medicine, Lasers in Medicine.

Physics of Diagnostic X Rays **:**Making an X-ray image, Radiation to patients from x-rays. Producing Live X-ray images-Fluoroscopy

UNIT III: RADIO ISOTOPES IN MEDICINE (NUCLEAR MEDICINE)

(15 HRS.)

Sources of Radioactivity for Nuclear Medicine, Basic Instrumentation and its clinical applications, Nuclear Medicine Imaging Devices, Therapy with radioactivity, Radiation Doses in Nuclear Medicines

UNIT IV: RADIATION PROTECTION IN MEDICINE (15 HRS.)

Biological effects of Ionizing Radiation, Radiation protection in Diagnostic Radiology, Radiation protection in Radiation therapy, Radiation protection in Nuclear Medicine, Radiation Accidents

UNIT V: COMPUTERS IN MEDICINE (13 HRS.)

History taking, Laboratory Automation, Electrocardiogram Interpretation, Patient Monitoring, Drug-Test interactions, prescribing Drug Dosage, Pulmonary Function Testing, Medical Record systems, Hospitals book keeping, other uses of computers in Medicine.

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (2 HRS.)

Adaptive radiation therapy-artificial intelligence

REFERENCES

1. John R.Cameron & James G.Skofronick “Medical Physics”, A Wiley-Interscience Publication,John Wiley & Sons

2. Irina Cromwell, Carol Weibell, Lianne Pfeiffer –Biomedical Instrumentation and Measurements –Prentice Hall of India Pvt .Ltd ,New Delhi .

III B.Sc.

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P6ME3	Opto Electronics	Major Elective	5	5

COURSE DESCRIPTION

Aim of this course is to enable the student to understand the concepts in semiconducting materials and fiber optic systems which forms the basis for communication systems.

COURSE OBJECTIVES

Communication Electronweics is a challenging field. This course aims at giving an idea about fiber optics systems and communication. This course also deals with the semiconductors and stimulated emission in intrinsic semiconductors and photo detectors.

UNIT I: FIBER OPTICS (15HRS.)

Forms of communication Systems- The evolution of fiber optic systems -elements of an optical fiber transmission link -The quantum nature of light- basic optical laws & definitions- optical fiber modes and configurations -fiber types -rays and modes -step index fiber structure - ray optics representations -wave representation.

UNIT II: FIBER OPTICS LOSSES [15 HRS.]

Introduction- Attenuation -Material absorption losses in silica glass fibers: intrinsic absorption, extrinsic absorption -linear scattering losses: Rayleigh scattering, Mie scattering- non-linear scattering losses: stimulated Brillouin scattering, stimulated Raman scattering- Bending losses -core and cladding losses-signal distortion in optical wave guides -information capacity

determination -refractive index profiles.

UNIT III: SEMICONDUCTOR LASER (15 HRS.)

Direct band gap semi conductors - Indirect band gap semi conductors- Spontaneous emission: electroluminescense- LEDs emitting different colors - Semiconductor laser: Basic principle of laser action –population inversion – Non-semiconductor laser system -Stimulated emission: Intrinsic semiconductors- Stimulated emission: p-n diode-salient points about LASER action

UNIT IV: PHOTODIODES (15 HRS.)

Photodetectors : photodetector materials - basic principles for optical detection- The p-n junction photo diode-The p-i -n photo diode -diffusion length and life time -Quantum efficiency -Responsivity -The p-i-n avalanche diode- Electron and hole ionization rates, Responsivity of avalanche photodiode.

UNIT V: OPTICAL FIBER SENSORS (15 HRS.)

Introduction- Optical fiber sensors- Phase and polarization fiber sensors- Ring interferometer with multiturn fiber coil- Optical fluid level detector- Optical fiber flow sonsors(Extrinsic)- Optical displacement sensors (Extrinsic)- Optical displacement- moiré fringe modulation sensors- Microbend optical fiber sensors: Introduction- Intrinsic fiber sensors measurement- Current measurement by single – mode optical fiber sensors-Fluoroptic temperature sensors-Photoelastic pressure sensors- Laser Doppler velocimeter using optical fiber.

UNIT VI: DYNAMISM (Evaluation Pattern-CIA only) (3 HRS.)

Application of fibers in telecommunication, Aircrafts and railway- Application of semiconductor in solar cells- Application of Photodiode in smoke detector.

REFERENCES

1. Gerd Keiser.” Optical fiber communications”. Second edition, McGraw-Hill International Edition. Singapore. 1991.

2. John M. Senior. ”Optical fiber Communications- principles and practice”. Second edition-Prentice-Hall of India Private Ltd. New Delhi.1996.

3. C.K. Sarkar &D.C.Sarkar. “Optoelectronics and Fiber optic communication”. I Edition, New Age International (P) Ltd., Publishers, New Delhi.2001

III B.Sc.

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/WEEK	CREDITS
UAPH	P6ME4	ENERGY PHYSICS	Major Elective	2	2

COURSE DESCRIPTION

This course intends to give a comprehensive description of existing types of conventional energy sources and aims to give a potential notion to resolve the challenges with regard to future supply and demand with the usage of various types of renewable energy sources like solar energy, geothermal energy , wind, biomass, tidal energy.

COURSE OBJECTIVES

The objective of this course is to introduce the basic ideas of conventional energy sources & their primary applications and impart knowledge on physics behind harnessing solar radiation , geothermal energy, magnetohydrodynamics, fuel cell, wind , biomass and ocean tides and waves as renewable energy resources and to let the students identify the remedies/potential solutions to the energy demand and supply based on energy conservation approach.

UNITS

UNIT –I ENERGY RESOURCES (6 HRS.)

Classification of energy resources – Conventional resources – Coal – Petroleum and Natural gas – Thermal power – Hydro Power – Nuclear Power – Nonconventional energy – Solar energy – Bio energy – Ocean energy – Wind energy – Geothermal energy – Magnetohydrodynamics – Animal energy **– Alternative Fuels(self study)**

UNIT –II SOLAR ENERGY (6 HRS.)

Solar Radiation – Physics of the Sun – Solar Position in relation to the earth – Solar Constant -Components- Some important application – Solar drying – Solar distillation – Solar Cooker – Solar energy collector – Solar water heater- Photovoltaic effect - Performance of Solar cell- Storage of solar energy – **water storage** – Solar pond. **(self study)**

UNIT –III GEOTHERMAL ENERGY (6 HRS.)

Geothermal energy - Geothermal resources – Uses of geothermal energy – hydrothermal convective system – Geothermal power plants – Dry field power plant.

Magnetohydrodynamics - power generator – ionising of a gas – method of ionising gas – MHD generator

Fuel cell – fundamentals of electrochemistry – types of fuel cells – hydrogen oxygen cell – bio chemical cell – **regenerative cells (self study)**

UNIT –IV WIND ENERGY (6 HRS.)

Wind energy- Technology – Principle of wind energy conversion – site evaluation – Wind turbines - **Biomass** – introduction – Photosynthesis – Biomass production efficiency – Biomass conversion – **Gasification of Biomass (self study)**

Ocean thermal energy- Technology– energy from **waves and tides** – Tidal barrage design – Modes of operations (Basic ideas, nature, applications, merits and demerits of these.)

UNIT –V ENERGY STORAGE & IMPACTS OF NON-CONVENTIONAL ENERGY - (6 HRS.)

Conservation of energy- Conservation principles in these sectors- Energy audit – Energy conservation – approach and technology- Energy options for the developing countries—Energy Storage- **Instrumentation and control (self study)**

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) (HRS.)

Recent industry trends in energy storage and applications

REFERENCES:

3. Kumar,D.S.() *Mechanical measurements and Control* Metropolitan Book Co., II Edition.
4. Larry Jones, Foster Chin,A. () *Electronic insrtuments and measurements.* J.Wiley & sons, Inc.

III B.Sc Physics

SEMESTER VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	P6SB5	ASTRONAMICAL MEASUREMENTS AND MATERIALS CHARACTERIZATION	Skill Based	2	2

COURSE DESCRIPTION

This course emphasis the basic principles and their measurement techniques of astronomical instruments such as optical telescope, Hubble space telescope, astronomical spectrograph, photoelectric photometry, spectrometry and also electron microscopes such as scanning electron microscopy, transmission electron microscopy and atomic force microscopy and X-ray diffraction measurements.

COURSE OBJECTIVES

This course provides the basic understanding required for the measuring techniques involved in astronomical instruments and also different characterizations of samples involved in material science.

UNITS

UNIT I: BASIC PHYSICS [4HRS]

Planck's theory of blackbody radiation- photoelectric effect – pressure of radiation –Doppler effect – Zeeman effect.

UNIT –II ASTRONOMICAL INSTRUMENTS [5HRS]

Optical telescopes-radio telescopes-Hubble space telescopes- astronomical spectrographs- Photographic and photoelectric photometry-Spectrophoto-

metry-Detectors and image processing.

UNIT –III ASTRONOMICAL MEASUREMENTS [6HRS]

Stellar magnitude sequence- absolute magnitude and the distance modulus-Bolometric magnitude –Stellar parallax and units of stellar distances-Harvard spectral classification- Hertzsprung –Russel diagram.

UNIT –IV MATERIAL CHARACTERIZATION [8HRS]

Scanning electron microscopy – principle and working only-transmission electron microscopy – Atomic force microscopy.

UNIT –V X-RAY DIFFRACTION MEASUREMENTS [7HRS]

X-ray diffraction method – Powder method – Determination of lattice constants- Photoelectron spectroscopy.

UNIT –VI DYNAMISM (Evaluation Pattern-CIA only) [2HRS]

Magnetic-field-free-Atomic-Resolution Scanning Tunneling Electron Microscope (MARS) – Protein Crystallography.

REFERENCES:

1. An Introduction to Astrophysics- Baidyanath Basu-Prentice Hall of India, Pvt Ltd.- Chapter 1 - (1.3 to 1.10)
Chapter 3- (3.1 to 3.3) and Chapter 4- 4.4 & 4.8
2. A basic course in crystallography –Jak Tareen and TRN Kutty-University Press – (relevant sections from pages 180-184)
3. Nano:The essentials –understanding Nanoscience and Nanotechnology-T. Pradeep – TMG Hill Publishing Co. Ltd. Newdelhi- (Pages 20- 31) relevant sections only.
4. Elements of Solid State Physics – II edition- J.P.Srivastava page 545

WEB REFERNCES :

1. https://www.nasa.gov/mission_pages/hubble/main/index.html
2. https://en.wikipedia.org/wiki/Hertzsprung%E2%80%93Russell_diagram
3. https://en.wikipedia.org/wiki/Characterization_(materials_science)

III B.Sc Physics

SEMESTER –VI

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	P6SB6	PHYSICS OF ADVANCED MEDICAL INSTRUMENTS	Skill Based	2	2

COURSE DESCRIPTION

This course emphasise the basic concepts and applications of Medical instruments which involves Radiography, X- Ray, Endoscopy, Computed Tomography , Magnetic Resonance Imaging , Linear Accelerator. Also provides the knowledge on Radiation protection in Diagnostic Radiology and Biomedical Computer Applications.

COURSE OBJECTIVES

This course provides the medical foundation required for the diagnostic and therapeutic applications of various medical instruments.

UNITS

UNIT –I Radiation in Medicine **(6 HRS.)**

Radiation in Medicine: Radiography - X- Ray- Endoscopy

UNIT –II Instruments in Medicine **(6 HRS.)**

Computed Tomography - Magnetic Resonance Imaging ,Linear Accelerator

UNIT –III Sound in Medicine **(7 HRS.)**

Sound in Medicine :medical applications of Ultrasonography

UNIT –IV Nuclear Medicine **(6 HRS.)**

applications of Nuclear Medicine – Radio Therapy with Radioactivity -

Radiation protection in Diagnostic Radiology

UNIT –V Computer Applications **(5HRS.)**

Biomedical Computer Applications

REFERENCES:

Books for reference:

1) John R. Cameron, James G. Skofronick- Medical Physics, John Wiley&Sons
2) Irina Cromwell, Carol Weibell,Lianne Pfeiffer-Biomedical Instrumentation and Measurements-Prentice Hall of India Pvt .Ltd., New Delhi

OFF CLASS PROGRAMMES

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19UGVAP1	DIGITAL PHOTOGRAPHY	CRASH	2	-

COURSE DESCRIPTION

This course teaches the most important functions and techniques of digital photography that will enable the students to take the perfect shot every time.

COURSE OBJECTIVES

The prime objective of this course is to produce students who define and recognize the creative process, analyze photos in terms of their artistic style and expressions, and have a practical understanding of digital photography.

UNIT I: [15 HRS.]

Introduction to photography- writing with light **-** Camera- basic parts of camera-important controls of camera –focussing aspects- Aperture – shutter speed –ISO - lighting-contrast-exposure-illumination and use of flash light

UNIT II: [15 HRS.]

Composition of photography - Develop the skill of capturing technically good images - Practicing indoor subjects like Passport, Portrait, Article, Still life subjects and outdoor subjects like landscape and moving object photography.

REFERENCES

1. S.Thiagarajan,The New Practical Photography, SultanChand & Sons, IV edition, 2007
2. David Kilpatrick, Basic Photography, Hamlyn London, 1984
3. Michael Freeman, Mastering Colour Digital Photography, Lark Books,2005

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	explain the three fundamental components of exposure namely shutter speed, aperture and ISO
CO 2	Handle SLR camera with a proper understanding of composition techniques and take professional photographs

OFF CLASS PROGRAMMES

For those who joined in 2019 onwards

PROGRAMME CODE	COURSE CODE	COURSE TITLE	CATEGORY	HRS/ WEEK	CREDITS
UAPH	19UGVACP1	MOBILE SERVICING	CERTIFICATE	2	-

COURSE DESCRIPTION

This course teaches the most important functions and techniques of Mobile servicing that will enable the students to troubleshoot the faults in mobiles.

COURSE OBJECTIVES

The prime objective of this course is to help students to identify business opportunities in this sector.

UNIT I: [30 HRS.]

Introduction to Electronics-Study about electronic Components-(Resistor,Capacitor,Diode,Transistor,IC,Mic,Speaker,Buzzer,Vibrator,..) and its use- Types of cellphone batteries- How we can check the condition of Battery?- Understand the concept of GSM technology-Explain the uses of GPRS,EDGE and Bluetooth & Infra Red- How we protect our phone and SIM card against unauthorized use by using Security code & PIN code- Release the blocked SIM card using PUK code- Study of cell phone block diagram (power supply section,Network section,charging section,Logic control section.

CDMA Cell phone working process and Compare with other Networks-Itroduction about Third Generation (3G) Phones- Introduction to Android phones,Wi-Fi

UNIT II: [30 HRS.]

Cell phone Security functions- How to check the components using

multimeter?-Handset opening and parts identification of Black&White,Colour and camera cell phones-The process of camera Dismantle Desoldering the components using SMD rework station-Soldering practice using Micro Soldering Station.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

NO.	COURSE OUTCOMES
CO 1	Repair and diagnose the problem of all kinds of faults in Mobile Phone handsets in Hardware as well Software and rectify the faults using tools and equipment and various software
CO 2	Identify the business opportunities in this sector to run a Mobile Handset Repairing unit